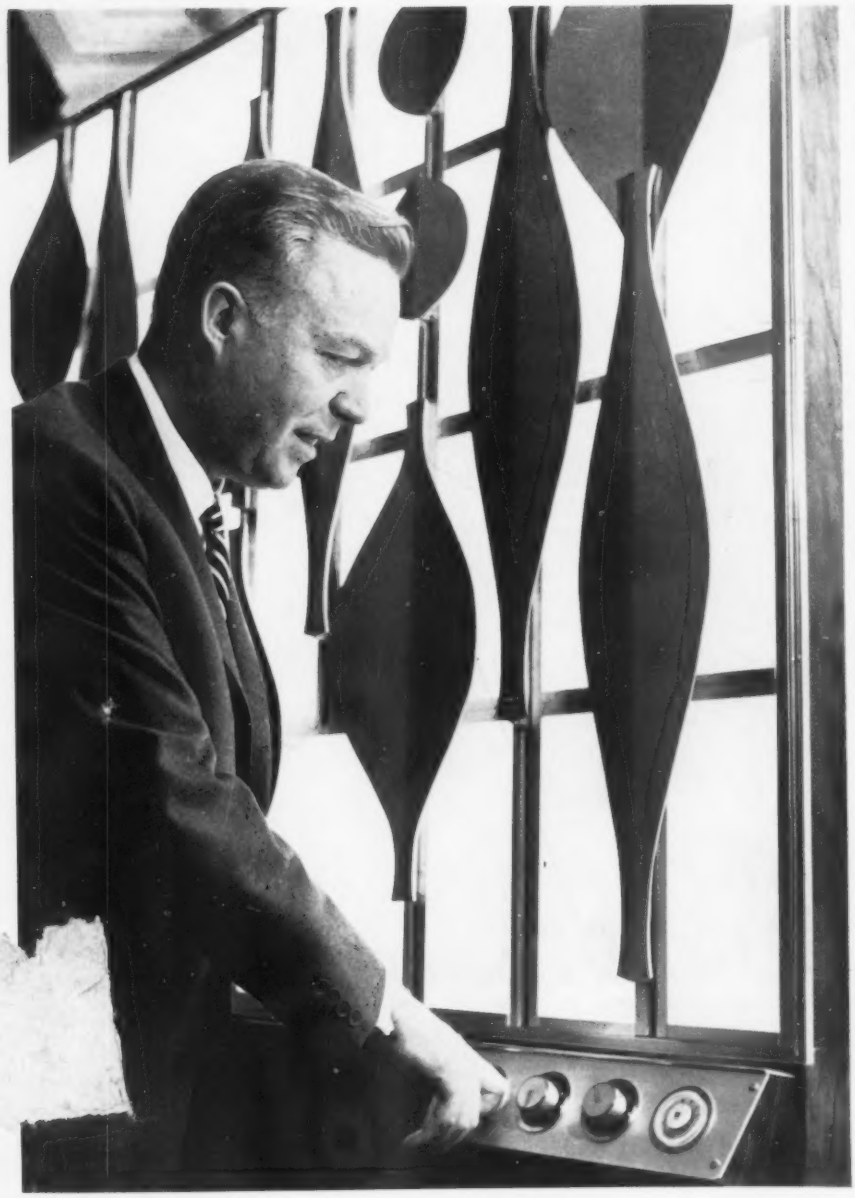
APRIL 1959

Electrical South

SOUTHERN MAGAZINE OF ELECTRICAL CONSTRUCTION

Serving the 18 Southern and Southwestern States



A single panel provides light, heat and cooling for tomorrow's homes—see page 27

NOW 1 + 1 = 1

16 lbs + 16 lbs = 21 lbs

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E + E = D

Here is the First Practical Single Case Ballast For Operating 2-96" or 2-72" VHO, SHO and PG Lamps

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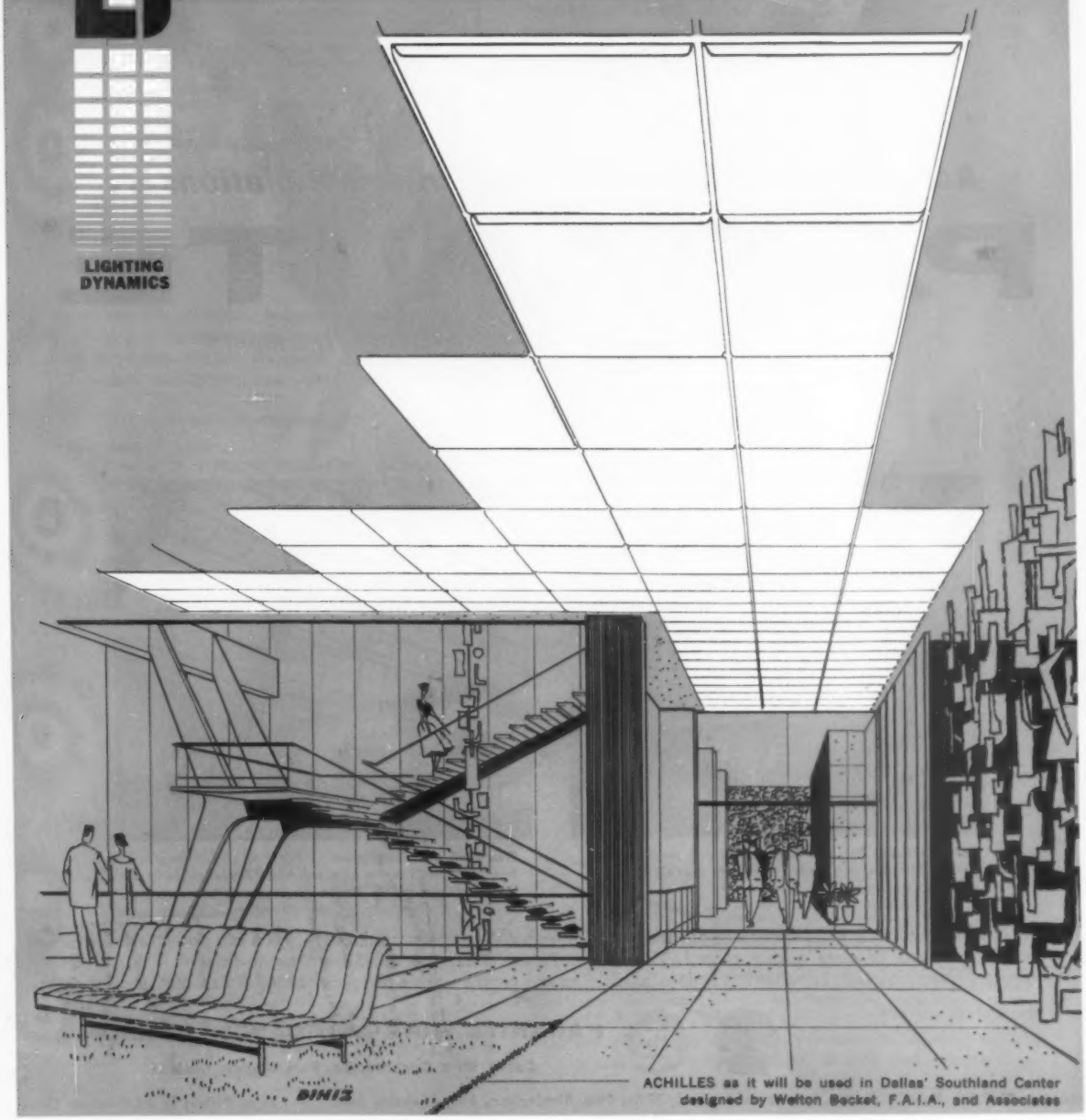

ACHILLES as it will be used in Dallas' Southland Center designed by Welton Becket, F.A.I.A., and Associates

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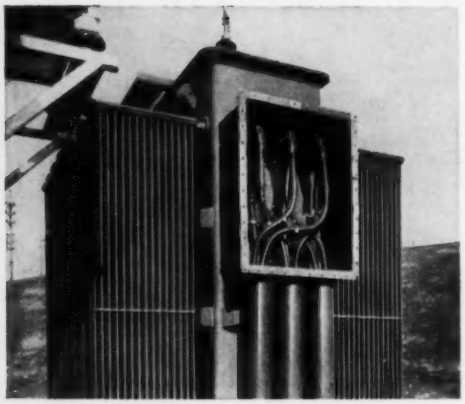
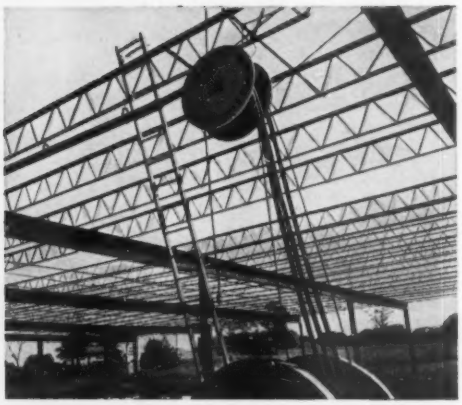


Paranite Super Pararite-Paraprene cable serves as the primary transformer feeder in a new municipal water pumping station.



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April, 1959 **Vol. 39—No. 4**

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Wiring Bureau plans for commercial wiring sales	22
Commercial wiring slogan "Planned Profit Power"	24
Edison Electric Institute's Housepower plans	25
New concept of tomorrow's Total Electric Home	26
15th annual national wiring sales conference	28
Roundup of utility wiring promotion plans	30
Annual meeting of NECA Carolina Chapter	40
A legal bid depository plan	42
Utility engineering section	47
Transmission substation grounding practice	68
Dead end design eliminates radio-TV trouble	70
Distribution system protective equipment	71
Parallel operation of regulators	76
Mobile vans demonstrate aluminum conduit	80
Economic comment	4
Washington report	8
Catalogs and bulletins	14
Postage-paid inquiry card	19
Know the law	42
Contractors tell how	88
Understanding the Code	90
Estimating data sheets	98
Association directory	102
News of the industry	104
Dates ahead	112
Helpful literature	117
Technical books	121
New electrical products	124

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

The active steel industry

One of the warmest signs in the 1959 economic picture to date has been the surging steel industry. Last year this industry and the automotive producers held back the prospects of a quick recovery following the recession. This year the steel industry has been rolling along toward a potentially record year, even though it is operating at about eighty per cent capacity.

What makes the situation even more amazing is the fact that steel's greatest customers, the automobile producers, have not as yet reached the record breaking pace prophesied for 1959. It has become a normal principle for economists of late to believe that a good steel year is dependent upon a good automotive year. The year 1959 gives the lie to such beliefs.

The truth of the matter lies in the upsurge in two other areas of economic activity, each working ahead of previously estimated schedules. Reference is made, of course, to the appliance business and to the large amount of new industrial and business construction. Both of these industries have proved that they can be of inestimable value to the steel producers for they have taken up the slack in steel production schedules in quite handy fashion. This could be an extremely healthy condition for the steel industry.

Whether steel will continue to hum along at this record pace is, of course, a matter of conjecture. One of the possible roadblocks is the threat of labor trouble and potential demands for pay increases. In recent years steel has not indicated any strong desire to resist union demands for higher wages, preferring to grant some increases and raise prices rather than to tamper with business conditions. And after each price rise, the products of other businesses have also shown an increase due to the higher costs of steel fabricated into their products. In fact, the steel industry has often been credited with a major influence in the inflationary pattern so prevalent since World War II.

Whether or not this is justified would require far more research than is practicable in the preparation of this column. But it is certainly realistic to believe that any further wage increases in 1959 that lead to higher steel prices will lead into another round of inflationary price hikes that may be of great danger to the future economic picture.

Recent reports from the American Iron and Steel Institute, an authoritative industry reporting body, indicate the extent of steel recovery since the low point reached in May, 1958. Shipments of finished steel products in January, 1959, were in excess of six million net tons, an increase of twelve per cent over those for December, 1958. Employed personnel in the industry was almost eleven per cent above the number on the payrolls as of May, 1958 and totalled approximately 555,000 in January. Moreover, the average employee work week was 38.1 hours as compared with 34.2 hours in May, 1958.

What about small cars

Reports during the past few months show real interest now among the automotive big three in the small car field. Ford, Chrysler, and Chevrolet will in all probability enter new small cars in the American market. Ford is the lone producer that has announced definite plans for 1960 but the other two manufacturers cannot be far behind.

The small car produced in the United States is not a novel idea or, in days gone by, there was the Crosley and the American Austin. Moreover, more recently, there have been the Willys, the Rambler, and this year the Lark. Of the ones in present production, only the Rambler has captured any semblance of the market and seems to be remarkably well entrenched.

Whether or not the new designs of the Big Three can supplant and surpass the Rambler remains to be seen. One thing is sure, the new small cars will have to offer something unusual with more built-in value than is presently available if they are to be successful. Small size, by and of itself, has not been sufficient to capture the American fancy.

It is estimated that the market in the United States for small cars, both domestic and foreign, is about 500,000 units per year. If the costs of operation, gasoline, taxes, depreciation, etc., continue to increase thus making economy a stronger factor in automobile purchasing, then it is possible that small car demand might well reach a million units per year. Thus, there is a market that remains virtually untapped for the automobile industry.

Capturing the market

However, recognizing the market and capturing it are two different things. For one thing there has been a certain air of prestige generally associated with the ownership of small imported models. Such prestige has in some cases permitted reduced quality in the products and even a reduction of passenger comfort. Certainly the American models will not be allowed the luxury of reduced quality or consumer satisfaction.

Widely divergent claims about the small American Car have been made, largely because few people outside of the industry know what plans are really afoot. Stories range from completely new designed cars to purely "stripped-down" current models. If the latter should be true there is no reason to doubt that such plans are fore-

(Continued on page 133)

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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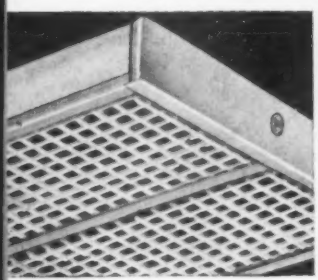

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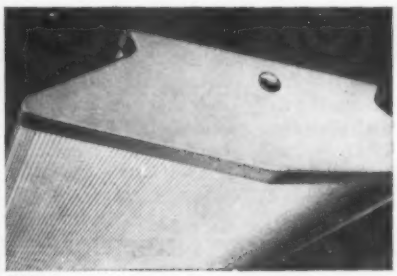

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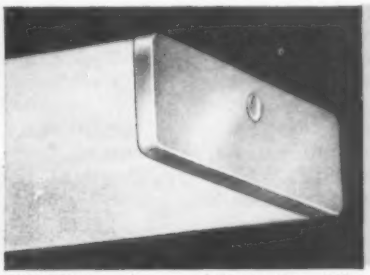

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Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

Kennedy bill passage likely—Passage by Congress of the Kennedy-Erwin labor reform bill or a bill closely resembling it is being predicted in Washington. Almost two-thirds of the Senators have already said they would vote for such a bill according to an informal poll.

The bill is aimed primarily at cleaning up corruption in labor unions; however, three sections affect the construction industry particularly. Under the bill:

Electrical contractors and unions will be able to negotiate agreements even before electricians are hired for jobs.

Unions will be able to negotiate agreements with electrical contractors (except in right-to-work states) requiring union membership within seven days of hire.

The legality of electrical contractor contributions to apprentice funds, training programs, pooled vacation funds, and the like will be clarified.

* * *

Prof praises Texas labor relations—Labor relations in the Texas electrical construction industry are excellent a former University of Texas professor reports with some pride. He also declares that Texas electrical contractors regard the state's right-to-work law at best as a nuisance.

These are the conclusions of Frederic Meyers. He made a ten-year study of the effects of the law in Texas, and his pamphlet, "Right to Work in Practice" has just been published.

Meyers declared:

"As is generally true throughout the country, labor relations in the organized electrical trades in Texas are excellent. Open conflicts [between unions and contractors] are few, wages and working conditions good, and union-management cooperation consistent.

"No doubt the continuous demand for the services of electrical subcontractors contributes in some measure to this. It is relatively easy to be friendly when the costs of friendship are passed on. In fact, one National Electrical Contractors Association officer explained in an interview that each increase in wages benefited the contractor because of the customary "cost plus" method of bidding. He felt the major problem of the industry was underestimating labor costs in drawing up bids."

Meyers notes that everybody knows that the right-to-work law is "systematically violated in the traditional closed shop industries." Except for electrical contractors union contractors generally approve of the law.

"The attitude of chapter officials and dominant members of the NECA," Meyers asserts, "is sharply different from that of most other contractors and association officials. In every case they said they are wholly satisfied with closed shop arrangements and regard them as of positive benefit to the trade. The law is regarded generally as a positive evil or, at best, as a nuisance to be disregarded as much as possible."

Elsewhere Meyers explains that "The principal value of the closed shop to the union electrical contractor appears to be the assurance that the worker referred by the union is qualified to do the job."

Electrical contractors who would like to read the report can obtain single copies free. Write to The Fund for The Republic, 60 East 42nd St., N. Y. 17, N. Y.

* * *

Technological change?—Building contractors in the U. S. were doing a record business in new construction in February. Dollar volume was 12 per cent above February 1958; contractors, however, were employing only about three per cent more workmen.

These are Department of Labor figures. The Department announced that new construction totaled $3,500,000,000 in February. At work in the construction trades were 2,242,000 men.

* * *

Electrical work safer — Electrical work is much safer now than in 1930, statistics published recently by the International Brotherhood of Electrical Workers reveal.

In 1957, 89 IBEW members died from electrocution. This was 2 per cent of all deaths in the union. In 1930 electrocution accounted for 7.6 per cent of the deaths.

Safety measures, codes, improved training, better working techniques, etc., are given credit.

* * *

Contract system may get a boost—In a big effort to keep factory construction and major repair work in the hands of contractors, contractor associations and construction unions are planning to form a top level council to boost the contract system.

In a joint statement, association and union officials have revealed the tentative plan.

The impetus behind the decision seems to be the continued loss of factory construction and repair work. Instead of contracting out work, industries are employing their own maintenance crews. Both union and association officials fear that the construction industry is pricing itself out of competition.

The heads of several employer associations and presidents of most of the building trades unions met at Miami recently. In a joint statement these officials announced that they had discussed common problems and that they had agreed to create a joint committee to "continue the study of these problems and their solution." The officials emphasized that the plans are indefinite, that right now they are just exploring possibilities.

John Dunlop, long-time chairman of the National Joint Board for the Settlement of Jurisdictional Disputes, is credited with proposing the idea for such a committee.

The employer groups included the Associated General Contractors and the National Constructors Association.

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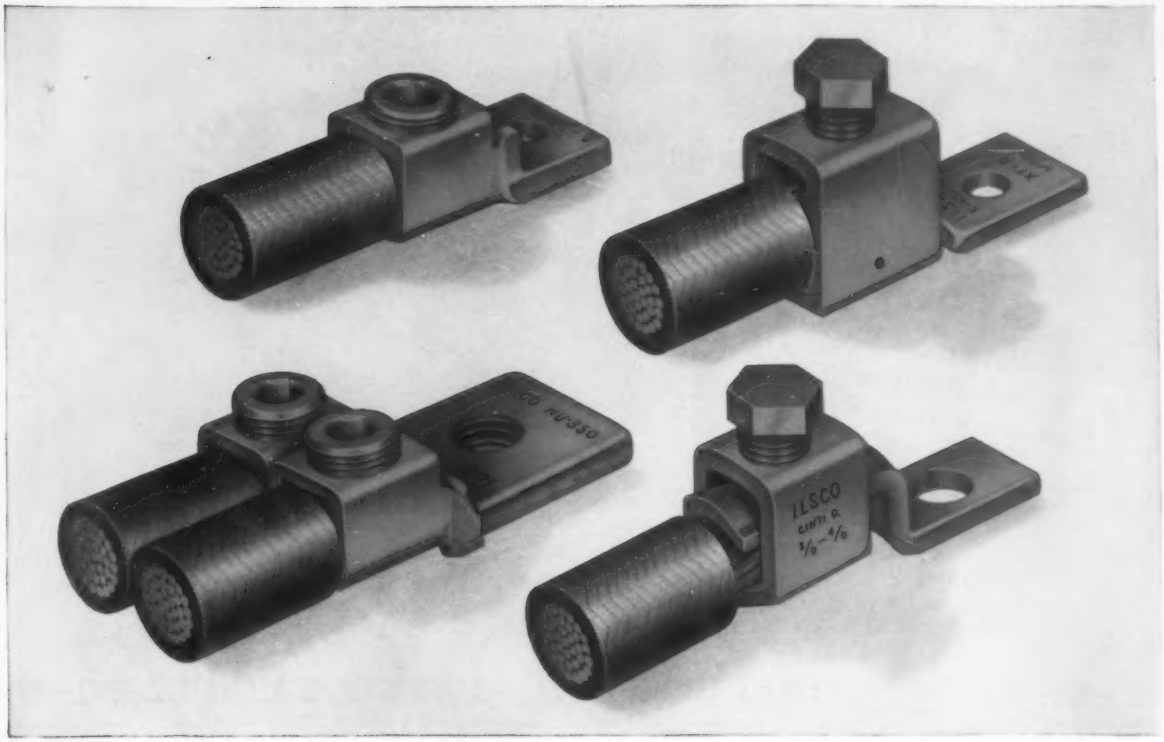

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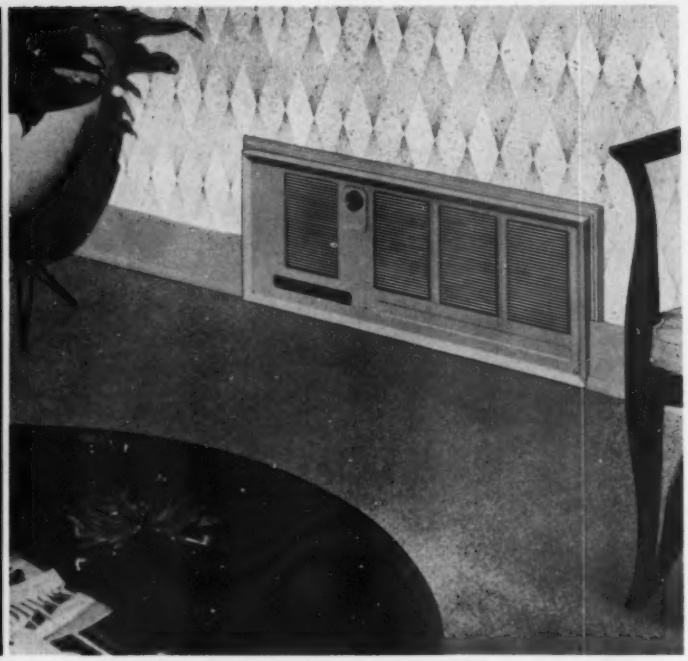

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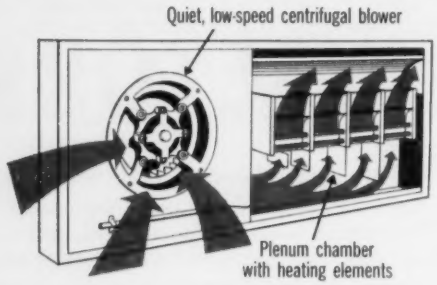

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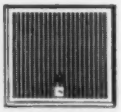
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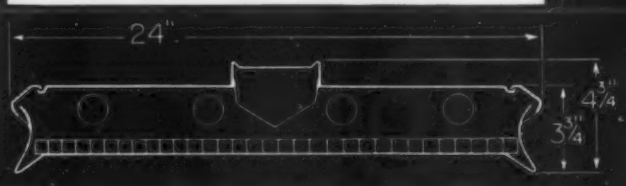
the sculptured look in lighting

SCULPTURAMA

Here is a new, richly formed Visionaire® which, like today's architecture, fuses the functional with the aesthetic. Gently curved illuminated metal sides and refined styling give these surface-mounted luminaires a modern, sculptured look. The low brightness illumination from the sides make the fixtures "blend" smoothly with the ceiling. Application versatility is greatly enhanced by a choice of single-element, fully framed diffusers including the Sunbeam-exclusive SUNLUX plastic lens panel. The diffuser assembly opens from either side on full-length, invisible hinges. Installation and maintenance requires a minimum use of tools. Units available for 2 or 4-lamp rapid start operation.

For complete details write for bulletin #A84A.



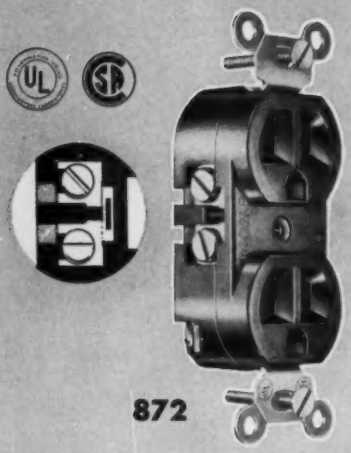
SUNBEAM visionaire

ENGINEERED FOR LONG BALLAST LIFE

SUNBEAM LIGHTING COMPANY • LOS ANGELES, CALIFORNIA • GARY, INDIANA

BECAUSE EASY WIRING SAVES INSTALLATION TIME AND MONEY

. . . Two All-New RODALE Receptacles* With Back Wiring!



872

Grounded Duplex Receptacle

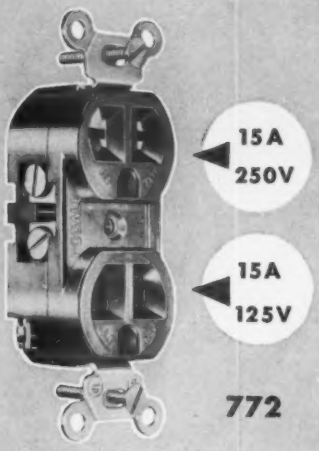
. . . with "break-off" feature FOR TWO SEPARATE CIRCUITS

Convenient "break-off" between line terminals permits two-circuit installation —allows for switch control of one outlet, if desired. Rated 15A-125V.

- SPECIFICATION GRADE — meets Federal Specifications — No. WR-00151b
- Plaster ears with convenient break-off type washers
- Takes #14, #12, #10 wire
- Can be used with 2-wire regular or polarized caps

FOR ALL 115V - 125V EQUIPMENT

Both Feature BACK WIRING for quick, simple installation



772

Grounded Combination Receptacle

ONE UNIT FOR TWO PIECES of Electrical Equipment Needing TWO DIFFERENT VOLTAGES

One receptacle supplies power both for a piece of 125V equipment (such as a power drill) and for a piece of 250V equipment (an air conditioner, for example). Saves the need for a second box.

- Takes #14, #12, #10 wire
- Plaster ears with convenient break-off type washers
- 125V receptacle can be used with 2-wire regular or polarized caps

***2 more reasons why you'll find . . .**

RODALE HAS A COMPLETE LINE OF WIRING DEVICES For Just About Any Job

Sold only through electrical wholesalers. For further information on #872, #772— or the complete line, write Rodale direct.

Rodale / manufacturing co., inc.
dept. S4, emmaus, pa.

PROTECT YOUR EXPENSIVE OVERHEAD EQUIPMENT WITH

WEAVER GROUNDS

Leading Electric Utilities Specify WEAVER Equipment for Long-lasting, Trouble-free Grounding

GROUND RODS

Heavy, uniform copper coating, molecularly bonded to a rigid steel core, assures permanent grounding. The copper is work-hardened and resists scarring in rocky soil. A special draw gives the core more rigidity and with machined point driving is easier . . . chamfered top eliminates mushrooming and splitting.

GROUND ROD CLAMPS

Cast of high-strength, silicon aluminum bronze, yet cost no more than extruded types of clamps. Design guarantees perfect alignment between ground wire and rod. Big half-inch screw with rounded point gives high pressure contact without damaging the copper on the rod . . . machine-cut threads withstand high torque without stripping or breaking. Available with socket or square heads.

POLE BOTTOM GROUND PLATES

Weaver Plates with 25% more copper area than other types of plates, provide better overload dispersal . . . yet cost no more. It is the only plate with a heavy duty cast bronze connector to give high pressure contact between plate and ground wire . . . assures long-lasting, safe grounding.

J. A. WEAVER Company

Ask Your Electrical Wholesaler for WEAVER Grounding Equipment

2110 Howard Street • St. Louis 6, Mo. • CEntral 1-8100

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

LIGHTING CONTROL—The Arrow-Hart and Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn., offers a one-page information sheet on their new quiet, tap action, lighting control switch, designed to fit any standard toggle wall plate.
Write in No. A100 on card, Pg. 19

FITTINGS AND FIXTURES — Information relative to explosion-proof fittings, fixtures, plugs and receptacles, and accessories is available in a 50-page book illustrating the complete line of these products manufactured by Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.
Write in No. A101 on card, Pg. 19

ELECTRICAL BOXES—Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 33, Pa., offers a catalog of their complete line.
Write in No. A102 on card, Pg. 19

GUY STRAND — An Engineering Data Sheet—E. D. 1878—describing the new Copperweld Type M Guy Strand. Contains table of physical properties as well as instructions for dead-ending this new high-strength, non-rusting guy strand. Available from Copperweld Steel Company, Frick Building, Pittsburgh 19, Pa.
Write in No. A103 on card, Pg. 19

ELECTRICAL FITTINGS — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrance, SEC, EMT and ground fittings and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.
Write in No. A104 on card, Pg. 19

CONSTRUCTION ANCHORS—"Anchoring for Power and Communication Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.
Write in No. A105 on card, Pg. 19

SERVICE PANELS — Information on protective electrical control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.
Write in No. A106 on card, Pg. 19

ELECTRICAL FITTINGS — Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.
Write in No. A107 on card, Pg. 19

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.
Write in No. A108 on card, Pg. 19

GENERAL CATALOG — General catalog of Royal Electric Corporation, Pawtucket, R. I. covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealer catalogs may be secured from Royal distributors.
Write in No. A109 on card, Pg. 19

CARBON PRODUCTS—A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.
Write in No. A110 on card, Pg. 19

POWER BENDER — The lightweight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.
Write in No. A111 on card, Pg. 19

ELECTRICAL EQUIPMENT—The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog 58' Guide, containing data on their lines of Safety Switches, Service Equipment, Distribution Panels, "E-Z-RED" Circuit Breakers, interchangeable and non-interchangeable, also wiring troughs.
Write in No. A113 on card, Pg. 19

COMPRESSION CONNECTORS—New and fully illustrated Bulletin 13 offered by the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo., shows their complete line of Squeezon compression fittings. They make all overhead distribution connections from line wire to ground rod on aluminum, ACSR, copper, or combinations of them. Application and installation data are given for tap connectors of several types; service entrance, splicing, jumper and repair sleeves; terminals, stirrups and ground fittings. Mechanical and hydraulic installing tools for both dead and hot line work are listed.
Write in No. A114 on card, Pg. 19

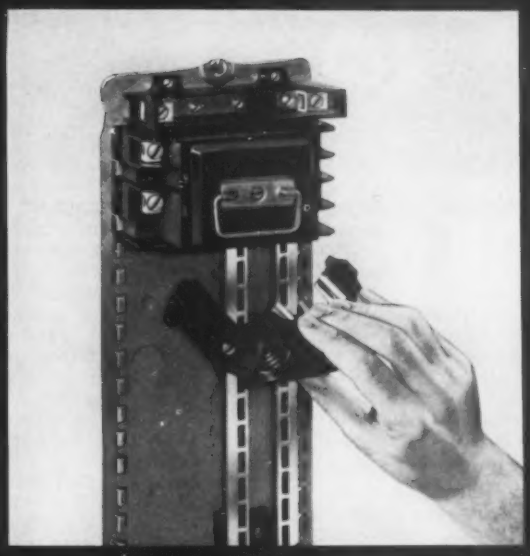
SELECTING FUSES — A 12-page descriptive handbook "Fuseology tells how to get safest most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. A115 on card, Pg. 19

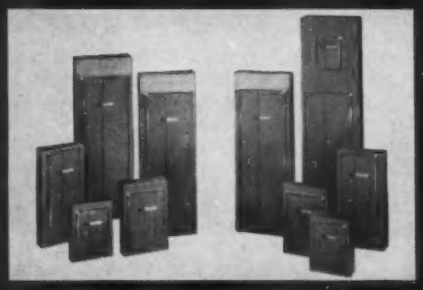
WIRE AND CABLE—Simplex Wire & Cable Co. announces a new catalogue of the family of ANHYDREX insulated cables. Catalogue No. 1028, which supersedes Nos. 1017 and 1018, is available on request from Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.
Write in No. A116 on card, Pg. 19

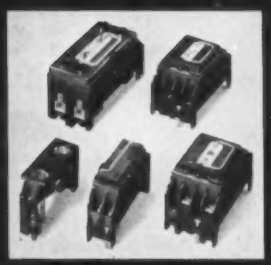
LIGHTING FIXTURE DATA—The Perfeclite Co., 1457 East 40th Street, Cleveland 3, Ohio, makes available the following literature: (1) Data Folder 54-B—4 pages of engineering information, prices and specifications on Plastic Indirect Concentric Ring Luminaires. (2) Data Folder EX-57—10 pages of information on Exit Units for all building locations. Complete Engineering data and prices given. (3) Data Folder 56-A—Information on Ceiling Pan Fixtures and Vapor Proof Prismatic Exterior Fixtures. (4) Data Folder 58-A on Concrete Mounting Boxes for recessed incandescent units. (5) Data Folder 58-B on Fluorescent Exit Units. (6) Data Folder 58-C on Phosphorescent Exit Units. (7) Data Folder 57-A on extra shallow recessed units and square ceiling pans. (8) Catalog 956—60 pages plus 12-page supplement, complete with descriptions and engineering information. (9) Data Sheet 58-D—a two-page description of square ceiling pan units and exterior conduit mounted-pan-type units.
Write in No. A117 on card, Pg. 19

Another Engineering Achievement

BIG NEWS!
ALL-NEW
STAB-IN
fusible service equipment







10 enclosures...5 stab-in units
replace 208 devices...meet all
requirements through 200 amps!

For the first time! Uncompromised flexibility—because there are no fixed circuits. Now you can tailor every installation to your exact requirements. Just stab-in circuits where you want them—when you want them! CHECK THESE FEATURES...

ENCLOSURES

- ✔ Only 10 enclosures: 5 split bus, 5 parallel.
- ✔ Dual rated for service entrance and load center applications.
- ✔ Exclusive "picture frame" combination flush/surface feature.
- ✔ Exclusive sequence bussing.
- ✔ Step-type insulated neutrals.
- ✔ Narrow width—shallow depth.
- ✔ UL approved for both copper and aluminum cable.

STAB-IN UNITS

- ✔ Only 5 stab-in units: 30 amp Twin Plug-Fuse Unit, 30 amp Cartridge-fuse Pullout, 60 amp Main Cartridge-fuse Pullout, 60 amp Branch Cartridge-fuse Pullout, 100 amp Cartridge-fuse Pullout.
- ✔ Exclusive "millions-tested" four-way stabs.
- ✔ Unique locking clip insures non-interchangeability. Defeatable by qualified contractor.
- ✔ Compact new space-saving 30 and 100 amp pullout units.

Now you can afford to carry your own stock and meet all your fusible requirements through 200 amps. Get the proof! Write for Bulletin 1-215, Federal Pacific Electric Company, General Offices: Dept. 322, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

ELECTRICAL ENCLOSURES — Catalog No. 5354 currently being offered to the trade by B & C Metal Stamping Co., 590 Means St., N. W., Atlanta, Ga., is a well-organized compact 94-page manual giving complete descriptive information, prices, and specifications on all items in the B & C line of electrical enclosures. Copies are available free of charge to electrical contractors.

Write in No. A119 on card, Pg. 19

ELECTRICAL FITTINGS—Concise 36-page catalog illustrates and describes a complete line of electrical fittings, cable racks and wiring specialties. The catalog contains many detail drawings, clear-cut photographic illustrations of mast fittings, cable connectors, straps, hangers and ground clamps in a wide variety of types and sizes. For your free copy, write The M. & W. Electric Mfg. Co., East Palestine, Ohio.

Write in No. A120 on card, Pg. 19

CABLE CONNECTORS — Tomic Sales and Engineering Co., 20000 Sherwood Ave., Detroit 34, Mich., now have available catalog sheets containing data on the complete line of their connectors, couplings, and cable connectors.

Write in No. A121 on card, Pg. 19

WIRING DEVICES — A complete new catalog of wiring devices is now available from Bell Electric Co., 5735 S. Claremont Ave., Chicago 36, Ill. The line includes a wide range of weatherproof receptacles and switches, portable garden lights, wall plates, and specialty items.

Write in No. A122 on card, Pg. 19

PLUG-IN REELITE — Complete details about Appleton's lightweight, portable automatic Reelites are given in an attractive 4-page catalog insert. These devices find application in a wide range of occupancies: garages, loading docks, garment industry, construction crews, warehouses, machine shops, etc. Write to Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

Write in No. A124 on card, Pg. 19

WIRING PRODUCTS — Various features of P&S Despard interchangeable wiring devices and detailed information concerning this line are offered in a brochure released by Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y. Included are such features as Camstrap for quick, easy installation, three-wire grounding, and pressure terminal devices.

Write in No. A125 on card, Pg. 19

FLUORESCENT BALLASTS—Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available Advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

Write in No. A126 on card, Pg. 19

GUTH INDUSTRIAL LIGHTING BROCHURE — New 8 page, 4 color brochure by The Edwin F. Guth Company, 2615 Washington Blvd., St. Louis 3, Missouri, describes Guth KOLORKODED industrial lighting fixtures. This unique innovation of color coding luminaires opens a new field in industrial lighting. Folder includes photographs, lighting data, engineering information and complete descriptive data on KOLORKODED luminaires and standard RLM reflector units. Write for your free copy.

Write in No. A127 on card, Pg. 19

WIRING DEVICES — Catalog No. 56, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc. Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible use in Industrial, Commercial and Residential applications.

Write in No. A128 on card, Pg. 19

ELECTRICAL CONDUITS — "National Electric Conduits" is the 20-page Catalog No. 603 which describes and illustrates the many types of electrical conduits manufactured by National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, Pa.

Write in No. A129 on card, Pg. 19

ANCHORING DEVICES—An illustrated 32-page catalog, No. 70, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.

Write in No. A131 on card, Pg. 19

CONNECTORS — Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 100-page manual issued by Burndy Corp., Norwalk, Conn., on connection techinques, connectors, and installation tooling.

Write in No. A132 on card, Pg. 19

CONDUIT FITTINGS—A new 24-page catalog, illustrating a complete line of conduit fittings, oval bodies type LB, LL, LR, and T, and lighting parts is now available from Elliott Electric Products Co., 1513 Olmstead Ave., New York 62, N. Y.

Write in No. A133 on card, Pg. 19

CONDUIT—Clayton Mark and Co., 1900 Dempster St. Evanston, Ill., has issued a bulletin describing their electrical metallic tubing, Electric-tube, and rigid steel conduit. The booklet is illustrated and contains information on design features, applications, and catalog data.

Write in No A134 on card, Pg. 19

ANTI-CORROSIVE PAINTS — Subox, Inc., Fairmount Plant, Hackensack, N. J., announces the availability of literature on their lines of anti-corrosive paints and coatings. Subox paints give protection for years and largely eliminate the need for scraping and repriming when repainting.

Write in No. A135 on card, Pg. 19

ELECTRIC TOOLS—A new catalog from Milwaukee Electric Tool Corp., 5316 West State St., Milwaukee 8, Wis., contains information on their lines of heavy duty electric tools for contractors and industry. The 34-page bulletin gives design features, specifications, and catalog information on all tools listed.

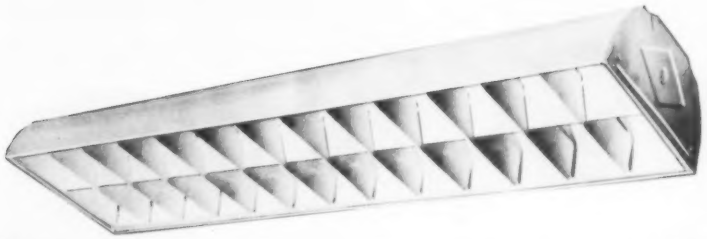
Write in No. A136 on card, Pg. 19

HYDRAULIC HOLE DIGGER — McCabe-Powers Body Co., 5900 N. Broadway, St. Louis 15, Mo., announces the publication of a folder describing the "Earth Master" hydraulic hole digger, series EM-2, which digs holes up to 30 inches in diameter.

Write in No. A137 on card, Pg. 19

ELECTRICAL EQUIPMENT — A new 12-page pictorial bulletin briefly describes manufacturing facilities and electrical products of Crouse-Hinds Co., Syracuse 1, N. Y. Emphasis is on the variety of equipment available in the four product lines: condulet electrical equipment, floodlights, aviation lighting equipment, and traffic control.

Write in No. A138 on card, Pg. 19



LIGHTING A SCHOOL?

. . . we suggest the **"L & P" PEABODY**

U. L. Approved

APPLICATION:

Here's an efficient, economical unit that creates abundant illumination — specifically designed for the schoolroom, office, and similar installations.

TYPE:

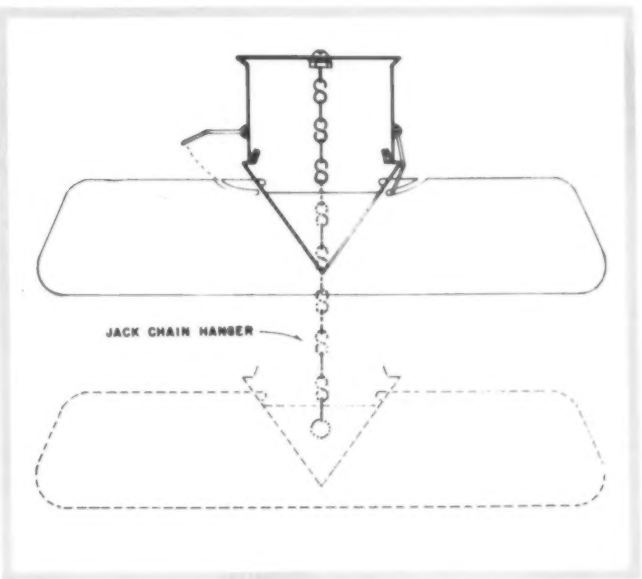
Fluorescent, rapid start or slimline. Two or four lamp units.

CONSTRUCTION:

High reflecting white baked enamel, 20 gauge steel drop-type louver, and well-planned construction make this an especially desirable unit. Side panels of steel (plastic panels also available). This line may be used to comply with Army Specifications F-13, F-131, F-14, F-141, and Navy 9YF-36, WL 131 or C. of E. numbers must be indicated. Ample knockouts, L & P quality finish.

MOUNTING:

Fixture may be surface or pendant mounted. Designed for continuous row or single unit installation.



Louver Latch

Cat. Series PB

For catalog and price sheets, write or phone today to

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENNESSEE

LIGHTING A CHURCH?

. . . we suggest the

Cat. No. 435—437

L & P DELTA BAFFLE LIGHT

All the quality, tested performance and economy that have earned Light & Power an enviable reputation in fluorescent fixtures are also available in the complete L & P Delta line of incandescent fixtures.

For your next church installation check these features of the Delta Baffle Light before you select your incandescent fixtures!

CONSTRUCTION:

Heavy duty gauge aluminum construction with baffles positioned to give complete cut off of light source from viewing angles of 45°. Top access for relamping above ceiling. Unit well ventilated for cool operation.

ELECTRICAL:

660W - 250V Heavy duty porcelain socket. Wired complete with 4½ Foot-No. 14 A.F. slow burning asbestos wire. UL approved. AFL-IBEW fabricated. Wired for 110V-60 cycle.

FINISH:

Face plate—Baked white enamel—Balance of fixture is Matte Black. All parts are bonderized baked to 375° to assure permanent finish.

SUPPLIED WITH PLASTER RING.

For catalog and price sheets, write or phone today to

DELTA delta incandescent division

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. • MEMPHIS, TENN.

Distributed by Wholesale Dealers Only

LIGHT & POWER L&P UTILITIES CORP.

There's an

L&P

Representative Near YOU!

For further information and prices on L & P fluorescent fixtures—standard or "custom-made"—check the following list, and phone or write the L & P representative nearest you:

N. B. Nichols
2509 Bishop
Little Rock, Arkansas

Craig-Owen
306 E. 11th St.
Chattanooga, Tenn.

C. V. Hammon
845 Southwest 52nd St.
Oklahoma City, Oklahoma

Irving Milow
415 Clover St.
Rochester, New York

W. J. Milner
3627 Peachtree Rd., N. E.
Atlanta, Georgia

J. Louis Weyhing
1914 Rutherford Ave.
Louisville, Kentucky

Irvin Spero
4142 Stillmore Rd.
South Euclid, Ohio

Howard E. Johnson
2976 Randy Lane
Dallas, Texas

Arthur H. Swartz
5003 Kelso St.
Houston, Texas

J. F. Hisserich
2001 Big Bend Ave.
St. Louis, Missouri

Joe E. Pearce & Associates
3845 N. Irvington St.
Indianapolis, Indiana

Associated Manufacturers Agents
900 Carondelet St.
New Orleans, Louisiana

Bill Sylvester
2144 Welton St.
Denver, Colorado

Newell L. Willard
3625 Ivy
Denver, Colorado

J. A. Goode Company
15842 James Couzens Ave.
Detroit 38, Michigan

Gerald Preacher
1225 Pickens
Columbia, South Carolina

Light & Power Utilities Corp.
1035 Firestone Blvd.
Memphis, Tennessee

INFORMATION CENTER

BOOKLETS • NEW PRODUCTS • ADVERTISEMENTS

Help yourself to free literature and more details on any product mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, tools, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Manufacturers' Literature

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

APRIL, 1959

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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Send free information on these ADVERTISEMENTS:

Company _____ Page _____ Company _____ Page _____
Company _____ Page _____ Company _____ Page _____

My Name _____ Position _____
My Company's Name _____
Address (number and street) _____
City _____ Zone _____ State _____

APRIL, 1959

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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Send this FREE LITERATURE (fill in key numbers):

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Company _____ Page _____ Company _____ Page _____
Company _____ Page _____ Company _____ Page _____

My Name _____ Position _____
My Company's Name _____
Address (number and street) _____
City _____ Zone _____ State _____

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Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 882, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

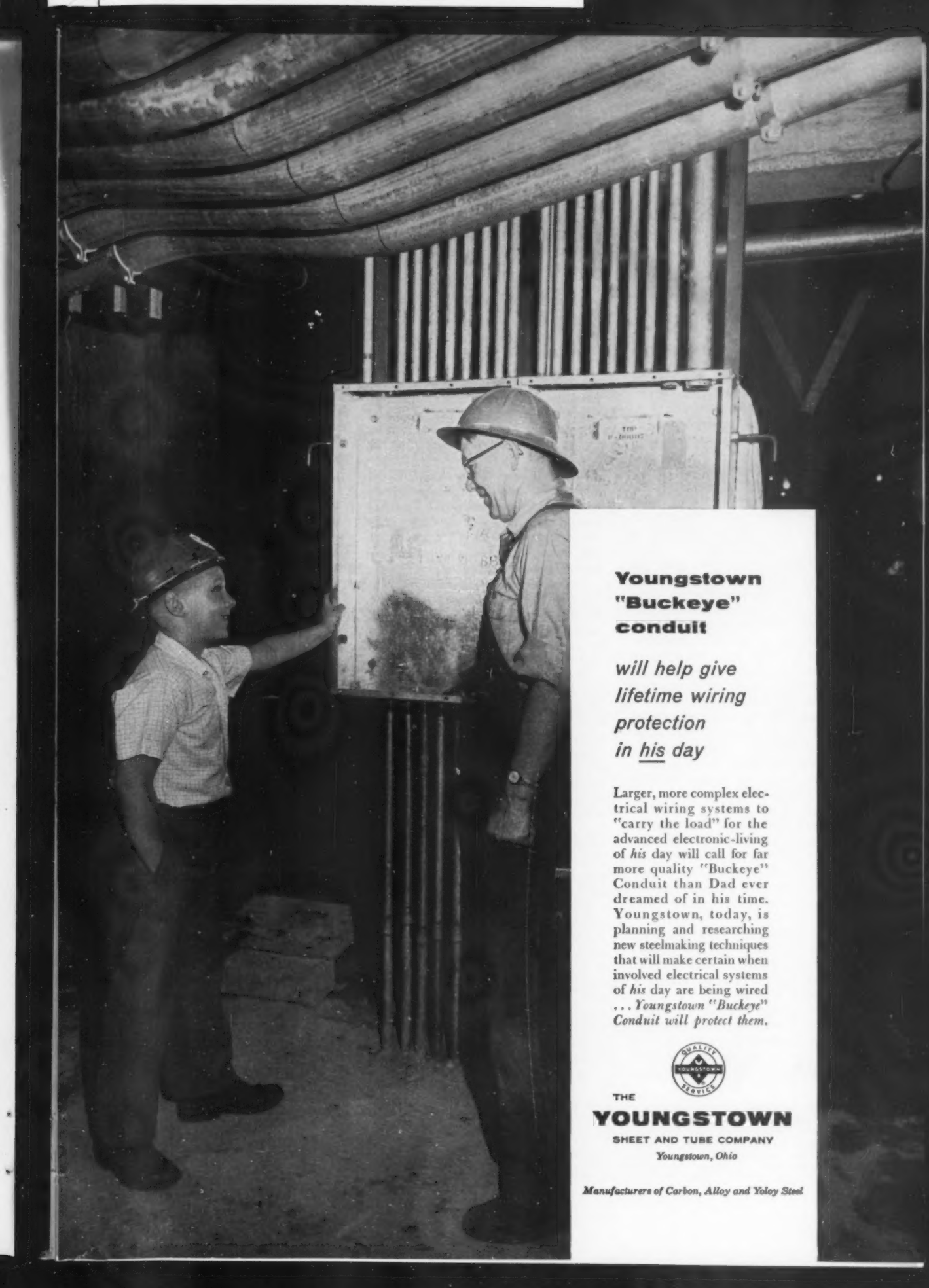
BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 882, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA



Youngstown "Buckeye" conduit

will help give lifetime wiring protection in his day

Larger, more complex electrical wiring systems to "carry the load" for the advanced electronic-living of *his* day will call for far more quality "Buckeye" Conduit than Dad ever dreamed of in his time. Youngstown, today, is planning and researching new steelmaking techniques that will make certain when involved electrical systems of *his* day are being wired ... *Youngstown "Buckeye" Conduit will protect them.*

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY
Youngstown, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel

Wiring Bureau plans for

By S. C. Blumenthal, Jr.*

Blumenthal-Kahn, Inc.
Electrical Contractors
Baltimore, Md.

This article should be especially helpful to the following readers:

- Electrial Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ DURING THE FIRST YEAR of the National Wiring Bureau's commercial wiring promotional campaign, we have simply tried to do the best we could—and that is what we intend to do in 1959.

Our approach to this program was hesitant at first, stemming largely from the fact that we were pioneering in a field relatively unchartered. Indications are that response to our program is growing, and this has provided us with an increasing degree of confidence that our work has been proceeding along the right lines.

The strides made in the short span of 12 months by the commercial wiring program have convinced us that there is no further need to refer to it as NWB's "newest baby."

An increased number of companies are looking to the bureau for promotional help. Our materials were purchased for use by 49 utilities and 45 individual contractors. Response, particularly by contractors, has been growing steadily week by week.

Staff reports indicate that increasing interest is being shown by contractors and utilities alike in doing something locally about a coordinated approach to the commercial wiring modernization market. Such a cooperative campaign has been undertaken with success in the city of St. Louis. Similar campaigns are being considered elsewhere. The bureau has a standing offer to lend assistance to groups wishing to set up such a program.

Wide range of plans

Each area has its own way of trying to stimulate commercial modernization. Some, like the Inland Empire Chapter of NECA, in Spokane, Wash., have heavily emphasized the direct mail approach, using NWB "teaser" post cards and "Electrifying Profits" sales folders to create new business for its members.

Others, like Connecticut Light and Power have sought to arouse interest in commercial wiring among their industry allies through the distribution of our plan books and contractor kits at specific industry meeting programs.

Using our all-purpose powerating sheets as sales tools, some, like Kentucky Utilities, have stressed direct calls to work with customers in analyzing their present wiring and their future needs.

Other areas have preferred to use NWB materials to supplement literature prepared by various industry sources to reach their commercial customer. Southwestern Power Service, for instance, in separate special lighting promotion campaigns aimed at food stores, drug stores, and offices, used NWB's general wiring folder, "Are You Getting the Most Out of Your Electricity?" and appropriate "Electrifying Profits" folders to supplement their own company leaflets.

Additional items circulated to prospects on the Southwestern Public Service's mailing lists included Electrical Information Publications' pieces on wiring and lighting—"Increasing Store Profits," "Is Your Store Lost?", "Beware of that Old Gray Mare Weak Lighting," "Office Work Should Be Light Work," and "More Power for Modern Offices."

Toledo Edison, to cite another highly successful office modernization mailing campaign, used NWB's "Four Ways to Boost Income in Offices," along with a special covering letter, as an initial mailing. This was followed up by personal calls, the two EIP office pieces, EEI's "The Case of Gloomy Gertrude," and finally by an office lighting manual put out by Nela Park.

Still other areas, such as the Baltimore NECA chapter, drew inspiration for launching a concerted direct mail and space advertising campaign from the Bureau's activities and its catch-line of "Electrifying Profits."

Wiring standards needed

The program of promoting commercial wiring is proceeding without a basic set of standards such as are present in the residential field. We are, therefore, looking forward to the forthcoming publication of the American Institute of Electrical Engineers' commercial wiring handbook. As a design guide, this may well serve at least as a partial solution.

The name given to our program of promoting commercial wiring is "Planned Profit Power." This phrase succeeds the term "Usepower," which was chosen only after testing in the field demonstrated there was less objection to it than any other term proposed. "Usepower," in other words, was actually a negative choice.

Since its introduction, opposition to the term set in, indicating that the entire program might conceivably be jeopardized by its continued use.

As a substitute, "Planned Profit Power" was chosen, and it is featured in our new brochure. Perhaps this is not the answer we are searching for, but it is the best catch-phrase offered to date, and we intend to make use of it and keep an open mind toward it.

The bureau will continue to make available the following publicity material to contractors and utilities: "Electrifying Profits" folders; "teaser" post cards; ad mats; and Powerating sheets pitched to the commercial customer's point of view. Also available to help those interested in commercial wiring are the plan book, "Let's Talk Business," the "How-To" kit, and the color slide presentation, "The Care and Feeding of Cash Registers," all of which emphasize

*Mr. Blumenthal is chairman of the Commercial Task Group, Plan Committee, National Wiring Bureau. This article is adapted from a talk made at the recent National Wiring Sales Conference in New Orleans.

commercial wiring sales

the "why" instead of the wiring, making our selling easier and our profits bigger.

For a year the NWB has been compiling data for a much-needed consumer "idea book." It has recently been published and wraps up for the first time the many ways in which Planned Profit Power is helping owners in all kinds of businesses to increase sales and profits. It is designed for use by utility company, contractor, and distributor salesmen to help customers visualize the possibilities of similar improvements in their own businesses.

During 1959, stepped up advertising by the bureau in magazines reaching five million businessmen will offer free copies of "The Big Difference." This ad will be a companion piece to the National Lighting Bureau advertising.

All told, there will be nine insertions of this ad. It will be seen in *Nation's Business* for March, April, May, September, and November and in the February, April October, and December issues of *Today's Business.*

The purpose of this extensive advertising is threefold: first, it will acquaint the public with the booklet so that they will recognize it when it is presented to them; secondly, it will obtain leads for the industry, since the names of those who demonstrated interest by requesting it will be forwarded for follow-up to local areas; and finally, this a d v e r t i s i n g will demonstrate to the industry that the National Wiring Bureau is in the commercial market permanently.

Local contractors and utility companies may take full advantage of this publicity by running this or a similar ad in local trade publications. Mats, electros, and reproducible proofs are available for this purpose.

Four-point promotion plan

The Bureau has prepared a four-point strategy for use by those concerned with commercial wiring. Some points may seem a bit elementary, but it never pays

(Continued on page 36)

Designed to boost demand for wiring modernization, this brochure contains suggested ways merchants can boost profits and volume through greater use of electrical facilities.

Commercial wiring slogan: "Planned Profit Power"

◆ IN CONJUNCTION with the National Wiring Bureau's commercial wiring promotion program, Planned Profit Power, the organization has released a 16-page brochure covering the ways merchants and owners can increase sales and profits through expanded use of electricity.

Called "The Big Difference is Planned Profit Power," this booklet contains 72 photographs of many different types of businesses showing modernized electrical features. Before-and-after case histories are offered as proof of the importance of electrical modernization. Specially-designed applications of electrically-operated devices, such as stencil makers, ovens, garment conveyors, elevators, and vending machines, are also illustrated.

Wiring is emphasized as the key to electrical improvement. Its economy of installation is brought out, with the comment that rewiring often requires only a few changes or additions.

Highlighted also are illustrations of wiring devices, accompanied by explanatory material. Included in the section illustrating various types of electrical equipment are five types of receptacles, an auto transformer, a room thermostat, a master control switch unit, time switch unit, distribution panels, and a service entrance panel.

The brochure also contains a short self-analysis check list to enable the businessman-reader to evaluate his own possible needs in wiring equipment.

Advertisements offering complimentary copies of this brochure are scheduled to be run in the March, April, May, September, and November issues of *Nation's Business* and in *Today's Business* for February, April, October, and December.

In addition, an opportunity has been offered local electrical organizations to insert this initial ad or a similar one in local trade publications. Mats of this ad, screened for newsprint, have been made available by the NWB at 50 cents each. Reproducibles for offset printing are available without to personnel and industry associates may be obtained from the bucharge. Reprints for distribution reau at $4.50 per 100.

The main purpose of the brochure, according to the bureau, is to help power salesmen, contractors, and distributor salesmen acquaint customers with methods of offering better service and realizing higher profit through the Planned Profit Power program.

Folders which can be used with this booklet to build direct mail campaigns for many different businesses are also available from the bureau. More will be prepared during the year. In production are two self-mailers aimed at the over-all commercial market and one specifically aimed at motels. Advertising mats, postal cards, and truck panel decals are also to be available.

With the brochure comes a check list for utilities, distributors, electrical leagues, contractors' associations, and electrical contractors suggesting applications of the booklet in promoting commercial modernization.

For utilities

1. Obtain copies for your sales personnel. Tell them about the national program and how they can tie-in locally. (See NWB's plan book, "Let's Talk Business," particularly page 20.)

2. Make copies available for distribution to logical prospects at local trade shows, meetings of customer groups, and through personal calls and direct mail.

3. Consider advertising programs: space, direct mail, radio and television, to place booklets in

(Continued on page 134)

EDISON ELECTRIC INSTITUTE'S HOUSEPOWER PLANS

◆ HOUSEPOWER, a national program to promote improved wiring in the home, has opened its spring '59 campaign. Sponsored jointly by Edison Electric Institute and the National Wiring Bureau, its stated purpose is to secure increased business for contractors.

In opening news releases, Housepower announced that the accent this year will be on the individual contractor. Each contractor will be tied in to the national campaign by advertising which refers to him as a "Housepower specialist." This, it is maintained, will connect the term Housepower with the electrical contractor—any electrical contractor.

The formal kickoff of the campaign came during National Electrical Week, Feb. 9 - 15. As part of their intensive advertising plans, a different "Photo-test" ad appeared in three issues of *Look* magazine during February and March. This ad was patterned after a permanent and popular feature of the magazine.

Following up this widely circulated advertising is an intriguing consumer hand-out and mailing piece with a facsimile of the *Look* cover on the front and a "teaser" line leading the reader to the inside pages which combine parts of all three ads printed in the magazine.

This publicity will be supported by continued educational advertising throughout the year in *Saturday Evening Post* and *Better Homes and Gardens*. These are full column ads containing cartoons accompanied by catchy limericks and related copy.

Edison Electric Institute, which maintains headquarters at 750 Third Ave., New York 17, N. Y., has offered to supply individual contractors with informative material designed to help him take fullest advantage locally of this intensive national advertising.

An illustrated, eight-page, two-color booklet now being distributed introduces contractors to the advertising and offers the four-page folder featuring reprints of the Housepower ads in *Look* magazine. Another feature of the booklet is a page devoted to testimonials from contractors who have profited from previous Housepower campaigns. The booklets have space on the back for the imprinting of individual messages.

Also available for use by contractors in private promotions are six ad mats, based on the "Photo-test" ads; folders; Housepower estimate-proposal forms for use by wiremen on the job; booklets; Housepower rating sheets; stickers for service trucks; and a Housepower drop cloth for use on the job. These pieces can be obtained separately or in a complete package.

A publicity release, designed to develop local editorial publicity for electrical contractors and announcing the new term Housepower specialist, referring to the contractor, has been prepared by the Housepower publicity staff. This release reminds the readers of the magazine advertisements, and states why the electrician must be a specialist in order to serve the changing needs of today's home-owner.

A pink price sheet, listing available Housepower promotion materials and their prices, is also being distributed. Besides the *Look* cover reprint folder, there is also the *Reader's Digest* cover with the Housepower ad reprinted in black and white on the inside. A special Housepower message appears on the back. This 5½" x 7½" folder, said to make an excellent handout piece, also may be obtained without the special back-page message.

An easel-backed, blue and black counter dispenser, designed to hold 50 of these *Reader's Digest* reprints, can be obtained.

To help the contractor sell his services to prospective customers, a complete sales training course is offered by Housepower. This forum on residential wiring modernization consists of a planning guide, leader's manual, audio-visual material, "take-home" booklets, and a visual sales presentation. All materials are contained in a fiberboard carrying case. Purchasers of this home-study course may receive additional "take-home" booklets and visual sales presentations. Further information, in the form of a free descriptive folder, is offered by EEI.

The visual sales presentation offers clearly stated, illustrated information, printed on loose-leaf, punched pages and bound in a ring-type notebook, providing the contractor with all information necessary for use when selling wiring modernization.

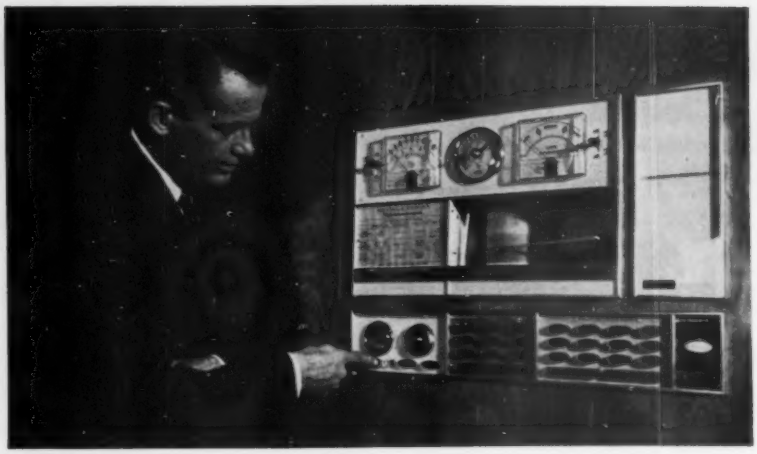
A 26-minute consumer film

(Continued on page 134)

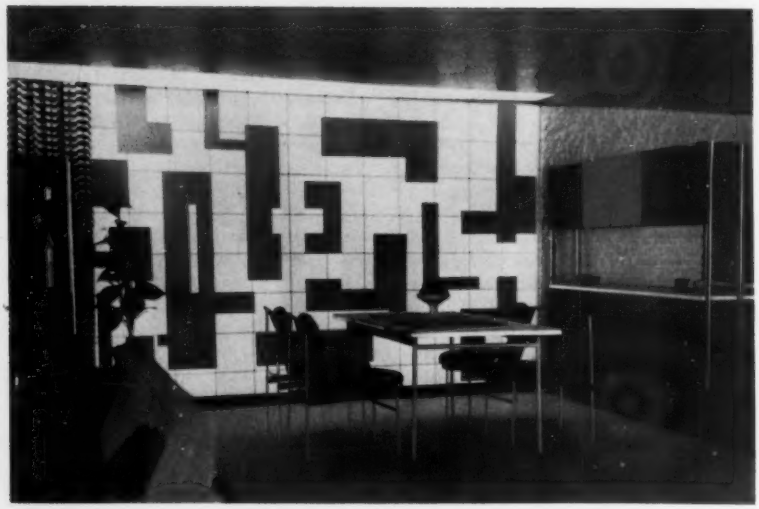
. . . educate your own personnel to the importance of

FULL HOUSEPOWER TO LIVE BETTER ELECTRICALLY

Weather control center, designed for the Westinghouse Total Electric Home, is the focal point for control of lighting as well as heating and cooling equipment. Control is provided for self-adjusting sun shades and draperies, the Precipitron air cleaner, and the germicidal lamps.



Below, entertainment center of the Westinghouse Total Electric Home soon to tour the country.



Lighting as well as heating or cooling may be supplied for the home of the future by a new wall panel developed by Westinghouse. Surface area for cooling or heating action is provided by thermoelectric units in patterns or "mobiles" which are superimposed upon the "Rayescent" light screen. Both light intensity and color can be varied.

New concept

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ A NEW IDEA in American homes, in which electricity does all the work—including heating, cooling, cooking, cleaning and entertaining—has been introduced by the Westinghouse Electric Corp. At the same time, Chris J. Witting, vice-president in charge of the company's consumer products group, said Westinghouse will spend $2,500,000 during 1959 on a public information program to introduce to the public "this new concept in American living—the Total Electric Home."

"We are convinced that we are on the verge of a new and popular demand and trend in home construction," Mr. Witting said. "This is the trend toward Total Electric Living in which electricity will provide not only the many conveniences which make life easier but will heat and cool a home electrically.

"Electric heating, properly planned and installed, is the finest and most comfortable form of heating to be found anywhere in the world. It is clean, odorless, quiet and,

# of tomorrow's Total Electric Home

most important, safe. It is not expensive and within the budget of millions of people in the country today."

Mr. Witting unveiled and described in detail home "electrical centers," or portions, of a model Total Electric Home which has been built and will tour the country. The "home" included a "Food Preparation Center," "a Weather Control Center," and an "Entertainment Center."

He described the Total Electric Home as "being readily available today, with today's technology and building techniques." He said that 90 per cent of the products used in the home can be purchased on the market today.

"We designed the Centers not as a model home and not to try and sell that home, but just to assure ourselves that everything we talked about was real and practical," he said. "The main difference between the Total Electric Home and conventional homes is that electricity does almost everything," Mr. Witting declared. "It illuminates, heats, cools, entertains, prepares and preserves food, does the manual labor and, above all, saves time so that families can see more of each other and do more things together."

The Entertainment Center, he said, is built so that everything for good home entertainment is easily accessible—a television set built into the wall; next to it a tape recorder, AM-FM radio, stereo hi-fi, records and tape storage, games, card tables and chairs.

"A flick of your finger in the Entertainment Center," Mr. Witting said, "and a movie screen descends to a position where it is ready for the showing of slides or home movies."

The "Weather Control Center" masterminds the atmosphere in the Total Electric Home. At this Center, it is possible to actuate heating and cooling equipment and to control the Precipitron electronic air cleaner and germicidal lamp which eliminate pollen and airborne health hazards. The Center controls self-adjusting sun shades and draperies. It can de-ice the sidewalk and driveway and, in dry spells, can control the lawn sprinklers. For the amateur weather man, the instrument panel contains wind direction and velocity gauges, a barometer, inside and outside thermometers, and relative humidity indicators.

A full-scale wall panel that promises to light tomorrow's home while also heating or cooling it has been unveiled by Westinghouse. The "hot-cold-light" panel responds to a set of dials which can change its temperature from a low of 55 to a high of 120 degrees Fahrenheit, and vary the intensity and color range of the light source.

The versatility of this "hot-cold-light" panel results from combining into a single operating unit two of man's latest technological advances: thermoelectric heating and cooling, and electroluminescent lighting, according to Mr. Witting. "The panel," he said, "opens up entirely new concepts for modern living."

"Where we now have separate components for lighting, heating, and cooling the home," Mr. Witting said, "the panel integrates them into a single unit which is at once functional and decorative. The possibilities for interior design are tremendous. A living room could be illuminated with a white or golden light during the day, for example, and then by converting to soft blue tones the same room could be transformed into a totally different mood for evening time.

"For festive occasions the color and intensity could be bright and cheerful. For a restful effect, tones could be soft and subdued. Entire sections of the ceiling could be covered with electroluminescent panels in full or in pattern.

"This achievement, however, is still very much in the developmental stage, and Westinghouse

(Continued on page 132)

The cover photo

Chris J. Witting, Westinghouse vice-president in charge of consumer products, operates the controls for the wall panel that will provide light, as well as heating or cooling, for tomorrow's homes.

15th annual national wiring

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ THE CONTINUING DEMAND, in the home and in business establishments, for increased wiring capacity, was the background against which delegates to the 15th Annual National Wiring Sales Conference discussed their plans for 1959. The two-day conference was held in New Orleans.

The conferees, 225 members of the electrical industry specifically interested in residential and commercial wiring promotion, included electrical contractors, electrical distributors, electrical manufacturers and representatives of utility companies, wiring bureaus and electrical leagues throughout the country.

Wiring sales "line" for 1959

The conference sessions, many of which will be the basis for local residential and commercial wiring promotions, included a dramatic presentation of the 1959 residential wiring sales "line." From this multi-million dollar "line" will hang such national and local promotions as Housepower, Medallion Home, Light for Living, and other allied sales promotions to help sell more wiring in the home so the consumer can "Live Better Electrically."

The presentation was made by J. Roscoe Furber, chairman of the Edison Electric Institute Housepower Committee and general sales manager, Northern States Power Company, Minneapolis, Minnesota; Robert E. Ingmire, of the Live Better Electrically Project, New York; and Andrew Doremus, chairman of the National Wiring Bureau's Plan Committee, and advertising manager, Construction Materials Sales, General Electric Company, Bridgeport, Connecticut.

Housepower, the program which in home towns all over the country during the past two and one half years, has resulted in rewiring thousands of houses, will continue to educate homeowners on the need for more and better wiring.

This national advertising program is flexible enough for local tie-in promotions; inter-industry support through advertising will be provided at all levels, and Edison Electric Institute and the National Wiring Bureau are supplying materials for local tie-in use. These are the elements of the new Housepower program which will help electrical contractors sell rewiring during 1959.

In addition, as a means of stimulating electrical modernization in some 20 million existing dwellings which have substandard wiring, the Medallion Home concept, previously a new home promotion, will be channeled into the modernization field.

It is estimated that, altogether, the 1959 coordinated program of the electrical industry in the residential wiring field, will amount to about 14 or 15 million dollars in advertising promotion. Edison Electric Institute will spend about $2½ million; Live Better Electrically about $1 million; Westinghouse about $2½ million; and individual manufacturers such as General Electric and Frigidaire will probably spend an additional several million dollars for advertising and television shows.

Commercial wiring program

Presenting the National Wiring Bureau's 1959 national program for promoting commercial wiring modernization, electrical contractor Sydney Blumenthal, of Blumenthal-Kahn, Baltimore, Md., and chairman of the Commercial

The panel discussions were an important part of the annual wiring sales conference. Participating in the electrical contractors panel, shown on opposite page, were (left to right): L. C. Brand, Brand Electric Co., Stone Mountain, Ga.; I. H. Clasen, Clasen Electric, Wichita, Kans.; Robert C. Marshall, Washington, D. C.; J. L. McClure, McClure Electric, Dallas, Texas; and Moderator Herbert E. Cook, Executive Secretary, Electrical Association of Detroit. The panel on this page presented the high lights of the several national electrical programs. They are, left to right, J. Roscoe Furber, general sales manager, Northern States Power Co.; Andrew Doremus, advertising manager, Construction Materials, General Electric Co.; and Robert E. Ingmire, manager, Inter-Industry Activities, Live Better Electrically Project.

sales conference

Task Group of the Bureau, gave conferees a look at some brand new promotion materials. A new consumer idea book entitled, "The Big Difference Is Planned Profit Power" is the result of a year's effort in carefully compiling data on the commercial wiring modernization market.

The brochure outlines ways in which electricity is helping owners in all kinds of business to increase sales and profits. The new book is intended to be used by utility and manufacturer representatives, contractors, and distributors.

New materials available

Mr. Blumenthal explained that national advertising during 1959 will help promote "The Big Difference." Other new promotional materials produced by the Bureau include three self-mailers; two of them directed to management in all types of business, and one prepared for owners and managers of motels.

It was pointed out that these new materials, combined with the existing commercial wiring promotional literature produced by the National Wiring Bureau, form a complete package for electrical contractors and utilities.

A look into future developments and applications of electricity was revealed by J. H. Fooks, director of engineering, Consumer Products, Westinghouse Electric Corp., Pittsburgh, Pa.

Looking ahead 10 and 20 years, Mr. Fooks predicted the construction of "total electric homes." This was the goal, he said, of Westinghouse in order to maintain the historical rate of growth in the residential area. "I do not mean," he said, "homes with merely a fair number of appliances, but rather homes in which everything will be run by electricity, and where electricity will be the only fuel."

Such a home would require a 200-amp entrance with at least six 240-volt circuits (30-amp capacity) to serve the major appliances, including not only cooling, but complete house heating. The average home today, he said, uses about 3,300 kwh per year. An average "total electric home" will use 8 to 10 times that much or between 25,000 to 30,000 kwh per year every year. Westinghouse, he said, is backing this program with a budget of $2½ million over the next two years.

R. W. Mayo, Editor of *Today's Business* forecast wonderful opportunities in increased electrical use in the "sizzling 60's." At least for those electrical contractors who learned to sell and to promote, and to "talk the customer's language." Without overwiring the commercial customer's premises, he said, the adequate electrical system of the coming decade should supply 20 watts per square foot; ten for present needs and an additional ten for reasonable growth.

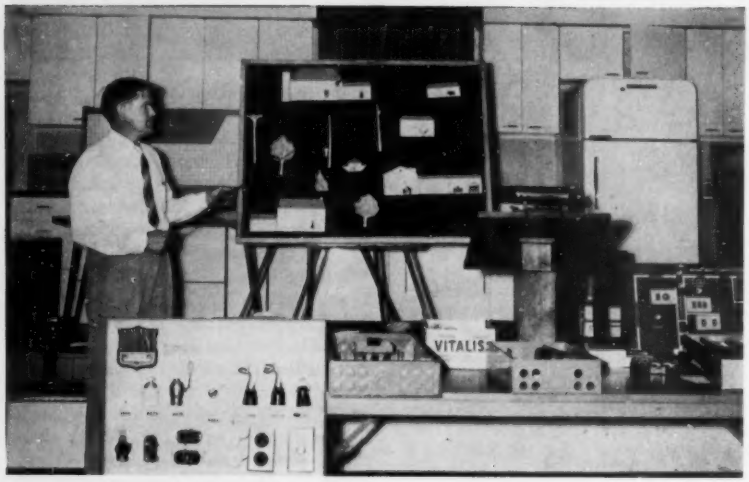
Housepower goes to school

Allan Dawson, promotion director of the Merrimack-Essex Company, Lowell, Massachusetts, explained the steps by which the Massachusetts Trade Schools adopted the Housepower sales

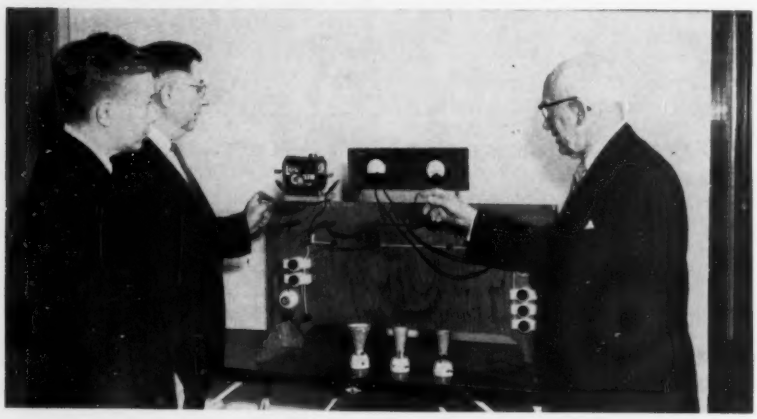
(Continued on page 134)

Roundup of utility promotion

Group, personal contact work continued by Alabama Power



Roland Oliver, district rural service engineer, Alabama Power Co., is shown delivering a flannel-board presentation of adequate farm wiring before a group of vocational agriculture teachers.



Above, left to right, Dr. Ben Briggs, Southern Research Institute, Hurst Mauldin, Alabama Power senior engineer in charge of rural youth activities, and T. W. Martin, Alabama Power chairman of the Board, view an instructional panel used in a 30-minute Science Youth Day telecast over the Alabama Educational Television network.

◆ For Alabama Power Company, adequate wiring is a continuous, long-term promotion rather than a spontaneous one to be revised every year, states Edward A. Wilson, company vice-president.

Basically, therefore, the same program will be followed in 1959 that was in effect during 1958. Personal contact and group meetings will be especially emphasized in 1959 after their success last year.

It should be noted that in 1958, Alabama Power home service advisors made 530 complete Housepower wiring diagrams. Almost 3,500 meetings, attended by slightly over 132,000 persons, included a discussion of the advantages of correct wiring. Films and other promotional materials were utilized at these meetings.

Farm safety survey

Rural service engineers laid particular stress on adequate wiring. During the early part of 1959, a survey was conducted among rural customers to determine exactly where the greatest emphasis was needed.

In the survey, 229 farms were visited. Of these, 22, or 9.6 per cent had two-wire service entrance; 207, or 90.4 per cent, had three-wire. In a check of service entrance switches, 21, or 9.2 per cent, had 30-amps; 168, or 73.4 per cent, had 60-amps; 33, or 14.4 per cent, had 100-amps; and seven, or 3.1 per cent, had 200-amps.

These figures, Wilson said, indicated a need for stepped-up promotional activity in the interest of larger service entrance capacity. Such activity has been begun through wiring ads directed to 100,000 farmers who receive the *Alabama Farm Bureau News;* through ads on wiring in *Electricity on the Farm* magazine, which is sent to about 19,000 farm customers; through a stepped-up program of attempting to interest farm customers in better wiring (43 wiring contractors placed adequate wiring exhibits in county

# of adequate wiring for 1959

fairs); and through a number of other media.

Rural engineers active

Rural service engineers made more farmstead wiring layouts in 1958 than for any other similar period. They made a total of 423 wiring layouts for farm customers. Nine out of ten layouts specified service entrance capacities of 100 amps or larger.

Adequate wiring talks and demonstrations were presented to 86 rural civic groups and community clubs, adult farmer classes, and vocational agriculture groups. The attendance at these meetings totaled 1,738. Wiring clinics were conducted during the summer months for vocational agriculture teachers. Residential as well as outside heavy-duty farm wiring was discussed with these teachers.

Dealers cooperated by letting the rural service engineers use wiring material, devices, and switches from their stock to demonstrate the newest types of equipment. The teachers showed a keen interest in adequate wiring, and requested that similar clinics be conducted in 1959. Alabama Power Company currently is making plans to comply with this request.

Rural service engineers maintained close contact with dealers in order to keep them informed about the latest trends and developments in wiring. Through these contacts, rural service engineers were able to see that adequate stocks and supplies were maintained to take care of the wiring needs in each dealer's area.

At the invitation of state and county 4-H Club leaders, rural service engineers attended 24 4-H Club summer camps. They participated in and assisted with all the activities of these camps. Demonstrations were given daily on adequate wiring and basic electrical subjects. The young people were encouraged to check their Housepower when they returned home.

One of the company's agricultural engineers serves as a guest teacher every other quarter in the vocational agriculture department at Alabama Polytechnic Institute. Adequate wiring is covered in detail with these future teachers. To make the instruction more realistic, a scale model house and all the necessary wiring and devices were furnished by the company so that the students could make practical application of the instruction received.

During 1958, Alabama Power Company continued to work with municipalities in its service area in upgrading municipal codes, with the result that two additional cities adopted the 100-amp. minimum entrance requirement. Similar work is being done with several other cities.

Promotion by Alabama Power of Bronze and Gold Medallion Homes in 1958 also is credited with spurring residential adequate wiring activity. Requirements for certification in the company's area are said to be rigid. Despite these requirements and the fact that the Medallion Homes promotion did not get under way until almost the middle of the year, 218 Medallion Homes and nine Gold Medallion Homes were opened to the public and were visited by some 28,000 interested observers.

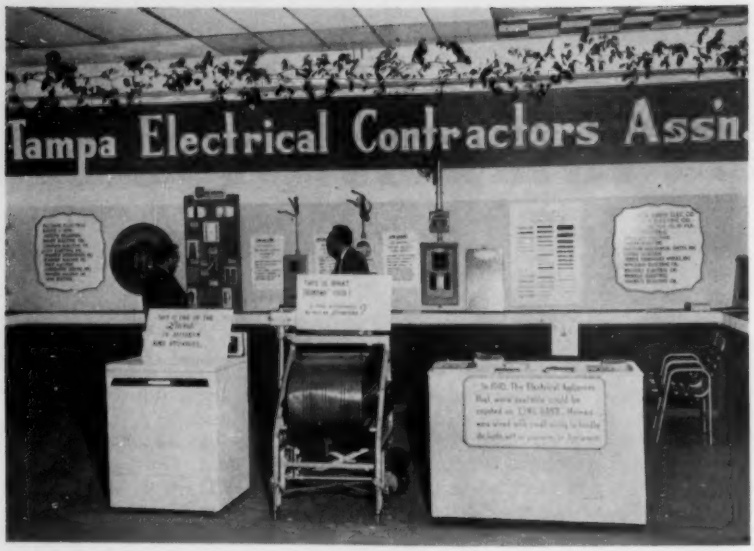
Tampa exposition booth space helps sell adequate wiring

◆ TAMPA Electric Company continues to be active with its advertising and public relations work promoting adequate wiring through the electrical contractors.

Space for an exhibit at the Florida Electrical Exposition is provided free of charge each year by the company for the Tampa Electrical Contractors Association, which designs and constructs the display.

One of the centers of attraction at the Tampa Electrical Contractors Association booth at the 1959 exposition, held at the Florida State Fair, was a display of all the tools necessary for an electrician to perform his job.

According to Malger Gray, Fluorescent Service, Inc., Tampa, and head of the contractors association, the group received more publicity from their exhibit this year than at any previous time.



The Tampa Electrical Contractors Association used their exhibit space at the Florida State Fair's Electrical Exposition to sell the public on adequate Housepower. The space for the exhibit was provided free by Tampa Electric Co.

Many thousands of pieces of informative literature concerning up-to-date wiring were distributed at the display. Among these were copies of the Housepower comic book published by Allis-Chalmers; Tampa Electric's colorful brochure on heat pumps, listing advantages and operation data; copies of a special electrical living booklet made available by *Living for Young Homemakers* magazine; and other materials supplied by Tampa Electric.

Monthly newspaper ads, as well as many special advertisements, will be devoted during 1959 to the Medallion Home program, according to Virgil Price, of Tampa Electric's advertising staff.

Full-scale program utilized to arouse customer interest

◆ A FULL-SCALE program to arouse customer interest in the Housepower program was carried out during 1958 by Kentucky Utilities, which has been a supporting member of the program since its inception in the Edison Electric Institute, writes Malcolm Mason, development engineer.

The company formed 25 Housepower certification councils, which serve as the major promotional media for Housepower in Kentucky Utilities' territory.

According to Mr. Mason, the certification councils have many advantages which make them a valuable part of the Housepower program. They lend authority to the wiring standards adopted and used by all 27 councils, protect individual members against any liability since each council, is fully incorporated as a non-profit organization, serve as springboards for special promotions of better wiring, and provide a medium of publicity readily accepted by newspapers since they do not publicize an individual business or firm.

Kentucky Utilities employees, it was pointed out, do not serve as presidents of councils but offer their services as secretaries.

Advertising played a big part in the 1958 program. Use of television was widespread as 13 Housepower films were used in rotation, appearing as 30- and 60-second spots on two large Kentucky television stations. Also used daily on 40 radio stations between the hours of 11 am and 1 pm were singing Housepower jingles.

Newspaper advertising following the EEI calendar and including a block on Housepower were carried in 113 newspapers across the territory. Ads were also prepared for use by the 25 certification councils. Copies of the ads were sent to local newspapers with the suggestion that they sell tie-in ads to members of the various councils.

Kentucky Utilities Company employee contests were used to bring employees closer to the national efforts. To tie-in with the national Housepower "Write-A-Caption" contest, a similar company employee contest was conducted. Also held among company employees was a wiring modernization sales contest, rated by Mason as "most effective."

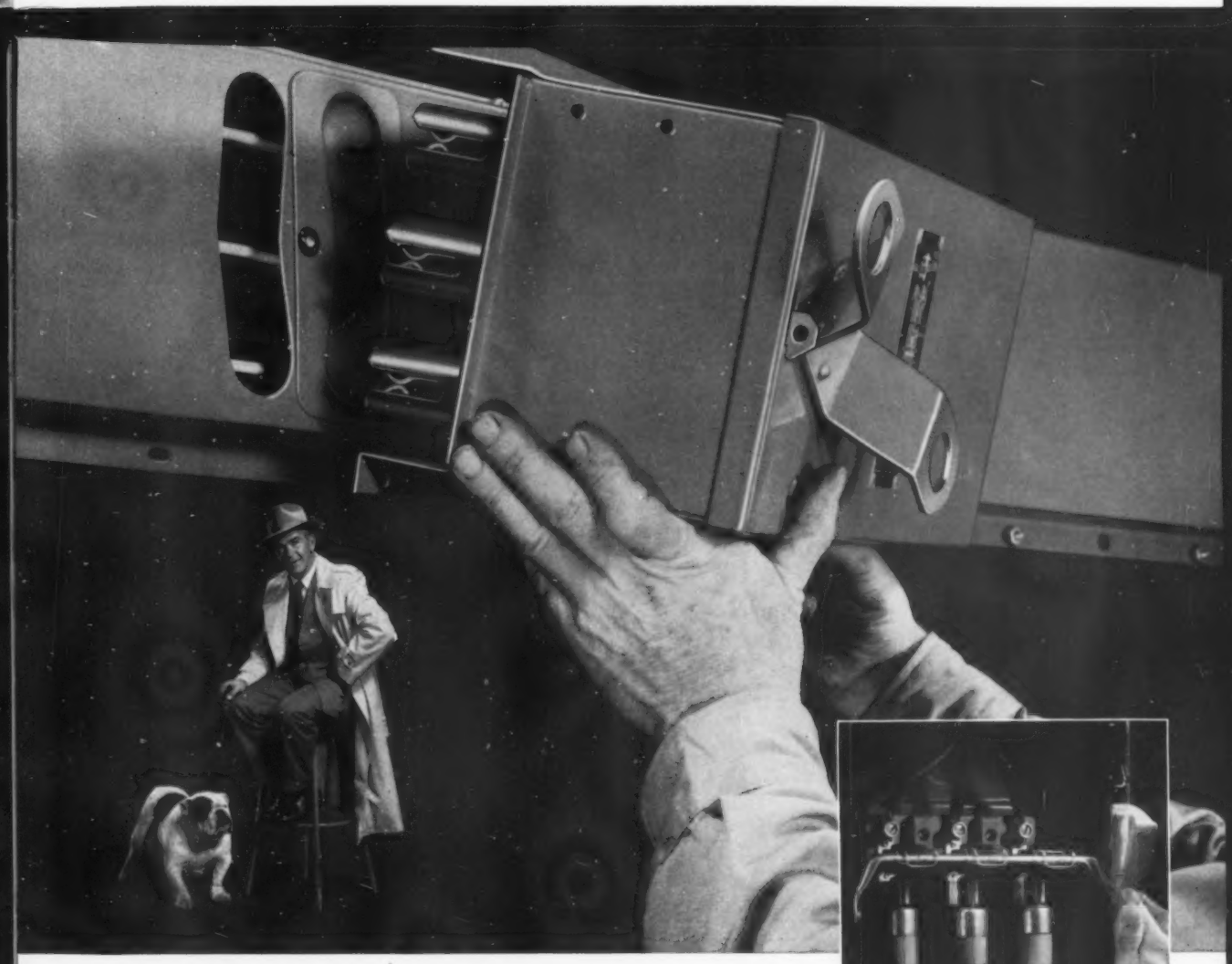
Cooperation given contractors

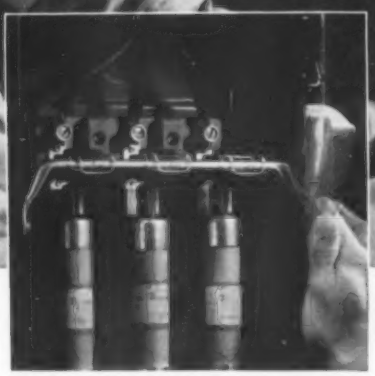
Full cooperation was given Kentucky contractors. The company gave its assistance to the Lexington Home Builders Association in promoting its "Idea Home." Full use was made of publicity in the promotion of homes awarded certificates of full Housepower and Bronze or Gold Medallions.

Contact was maintained with residential builders. A weekly ad was run in the bulletin of the Lexington Home Builders Association. Each company home demonstrator is required to give Housepower demonstrations throughout the year, often making use of Housepower films and displays. A flannel-board demonstration has also reportedly proved a useful aid. Housepower certification council decals are used by most members of the councils.

The power company maintains a policy of complete cooperation with electrical contractors. A contractor is advised when his name has been given a customer following the preparation of a wiring layout by Kentucky Utilities. Contractors are advised that company personnel will help them sell better wiring to their prospects.

During 1958, Housepower was incorporated as part of a load building program. Each district has a goal of 25 Housepower cer-





Vacu-Break chamber, shown above, smothers arcs at instant of break before they can pit or burn contacts. Dangerous flash explosion occurs at instant of "break" in open knifeblade unit shown below.

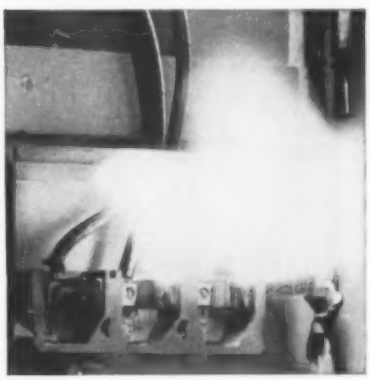
GET VACU-BREAK SAFETY IN BUS DUCT BY BULLDOG

And here's real built-in flexibility, too! Circuits plug in wherever needed with complete safety.

BullDog Plug-in Duct provides openings on 20-inch centers on either side of the duct. To tap "live" power you simply insert Vacu-Break® bus plugs. As the picture shows, reinforced fingers on all plugs insure positive pressure contact. Exclusive Vacu-Break action safeguards circuits and personnel. The enclosed arc chamber limits the oxygen supply . . . actually starves the arc before it can explode and pit or burn contacts. (The Vacu-Break bus plug has six companion plugs to meet other applications.)

Plug-in Duct is powered by Lo-X feeder duct—together they form BullDog's integrated BUStribution® system. Both ducts are available in standardized and interchangeable straight sections, elbows, tees and crosses . . . can be installed sideways, on edge, vertically or horizontally.

Protect clients against rewiring, downtime and costly production shutdowns! Specify *Bus Duct by BullDog.*



BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

Consult the following Southern representatives:

Wilson Electrical Equipment Co.
3210 Garrow St., P.O. Box 1725
Houston, Texas

Wilson Electrical Equipment Co.
101 E. Maple Street
San Antonio, Texas

Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

tifications and wiring modernizations in homes of two per cent of its residential customers.

The costs of a Housepower promotion are not, Mason said, an isolated part of Kentucky Utilities' budget, but a careful estimate of expenses indicates an expenditure of $33,000 for all types of advertising and $17,000 toward the EEI program and for employee participation.

Results of promotion

The company reported difficulty in securing information on wiring modernizations. But reports from electrical wholesalers in the company's territory indicate that the sale of 100 ampere service entrance devices and other modernization supplies has increased substantially over previous years. Over 100 homes were certified during the past year, and a good response to the Medallion Home promotion has been noted. A survey made on a sample number of modernization homes indicated a 20 per cent increase in kilowatt-hour sales.

The Housepower program, Mason concluded, will remain substantially the same in 1959 as it was in 1958, with particular emphasis being placed on the Housepower certification council program. Radio and television advertising will continue the promotion of Housepower and full advantage will be taken of coverage in *KU News* and *Dealer News*.

To encourage their participation in promoting full Housepower, private builders will receive a promotional allowance to assist with their advertising.

In their contacts with residential customers, customer service representatives will promote Housepower and offer the services of the Home Planning Bureau in furnishing layouts of adequate wiring for customers.

Other activities will be carried on in conjunction with the Electrical Association of New Orleans in promoting Housepower through electrical contractors and dealers.

In May, a booth at the 1959 Home Show will center around Housepower. This booth will be a joint project of the New Orleans Electrical Association, the South Louisiana NECA Chapter, Louisiana Power and Light Co., and New Orleans Public Service Inc.

All advertising media used in New Orleans wiring promotion

◆ ALL ADVERTISING media will be used to the fullest possible advantage to promote adequate wiring in New Orleans during 1959, according to J. R. Guidroz, sales promotion manager, New Orleans Public Service, Inc.

In addition to the usual use of newspaper space and radio time, this promotion includes window displays; a weekly half-hour television show, "Homemaker's Holiday;" the distribution as a service bill attachment of an informative pamphlet, *Homemaking*, which combines household and garden hints with Housepower advertising; the distribution to transit company riders of the weekly pamphlet *Rider's Digest;* and coverage in the industry publication, *Profit*.

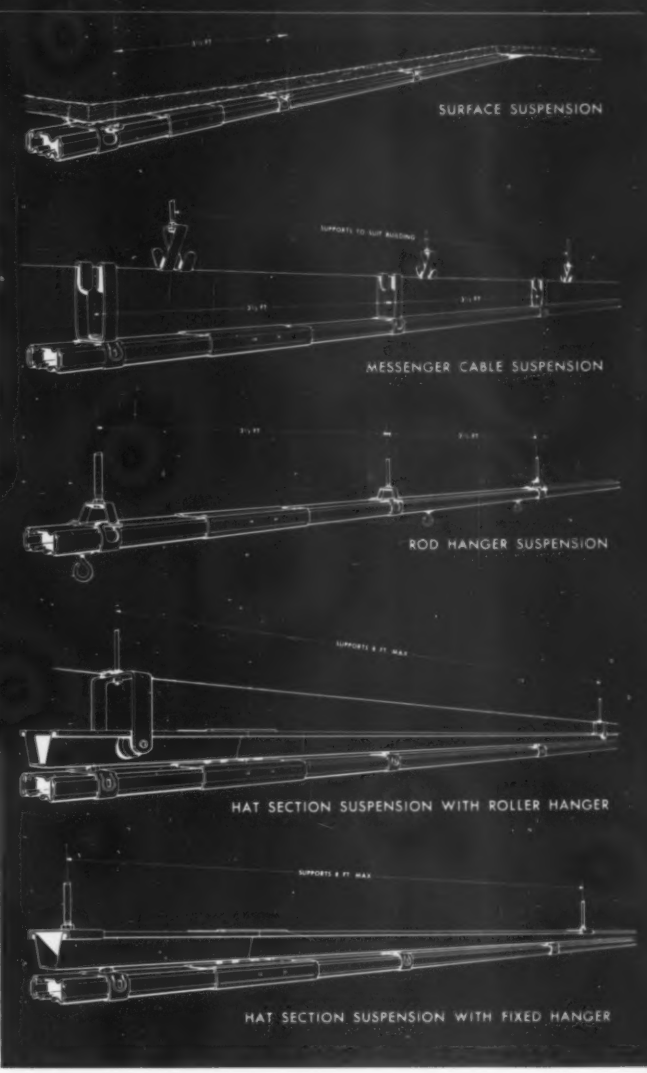
This Housepower booth was used by New Orleans Public Service Inc. at the May, 1958 New Orleans Home Show. The company plans widespread use of advertising for Housepower and a similar booth in 1959.

Utilities push Medallion home program

◆ PROMOTION of adequate wiring as part of the sales effort under the Electrical Living program is being emphasized by Louisiana Power & Light Company, according to its electric heating consultant, E. I. Blanchard. The company is also devoting much attention to the promotion in its territory of the Medallion Homes program, which includes Full Housepower. In addition, the company makes Housepower promotion an integral part of their promotions on behalf of appliances, kitchen planning, and light conditioning.

Interest in the Medallion Home program is increasing in the St. Louis area, reports Robert L. Coe, residential sales manager, Union Electric Company. The company maintains a rather extensive Medallion Home program which it considers most successful. Adequate wiring is reportedly less of a problem in St. Louis since the adoption of the 1956 National Electrical Code.

Cooperating with 16 builders and the Meyerland Company,


SURFACE SUSPENSION
MESSENGER CABLE SUSPENSION
ROD HANGER SUSPENSION
HAT SECTION SUSPENSION WITH ROLLER HANGER
HAT SECTION SUSPENSION WITH FIXED HANGER

TAKE YOUR CHOICE...
UNIVERSAL LIGHTING DUCT OFFERS 5 METHODS OF SUSPENSION!

You can solve virtually any lighting fixture placement problem with Bull-Dog Universal Lighting Duct. The prefabricated, standardized duct is amazingly easy to assemble and you have your choice of *five different suspension methods* for either the 20-amp or 50-amp ratings. One or a combination of these methods will adapt to any structure . . . and meet any installation requirement quickly and economically.

"ULD" is a continuous electrical outlet, with conductors running the entire length of the duct. Duct sections telescope together mechanically and electrically by a plain coupling. Light fixtures connect quickly by means of twist-out plugs which can be added or repositioned at any point. Plugs are available for direct fixture attachment or will take a standard attachment cap. The duct both feeds and supports fixtures . . . can be easily disassembled and relocated as lighting needs change.

You'll find Universal Lighting Duct is less costly than installed pipe and wire. And if the lighting plan is altered during construction, "ULD" can be repositioned without time-wasting "rewiring."

On your next wiring job look into the economies of Universal Lighting Duct. You'll find it is the most efficient, economical and flexible lighting duct system available. "ULD" is U/L listed.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

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Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

Houston Lighting & Power Company will participate in the third annual showing of Meyerland Showcase of Homes. W. F. Ehlers, supervisor of residential and farm sales, Houston Lighting & Power, predicts that several thousand interested home-owners and prospective home-owners will tour the 19 homes which will exhibit the latest in home design, construction, and electrical wiring. Extensive advertising support in the form of newspaper, radio, and television ads, billboards, and other media will be given to this promotion by the company.

The Housepower activity of Carolina Power and Light Company during 1958 was confined principally to follow-up work with electrical contractors who participated in the Housepower forums conducted in 1957. Four electrical leagues, believed to be an outgrowth of the Housepower program, were formed in 1958.

H. B. Hicks, residential and rural sales manager, reports that the 1959 Housepower program of Carolina Power and Light will be devoted primarily to an effort toward additional training for contractors on the technical aspects of good wiring. This program is designed to encourage contractors to carry on more promotional work through electrical leagues. This promotion would consist of direct mail, newspaper advertising, and tie-ins with Medallion open house promotions.

Hicks also noted a steady decline in the percentage of two-wire services on the company's system and an increase in the number of services of 100 amps and larger.

Roy A. Palmer, Duke Power Company, Charlotte, N. C., comments that his company's Medallion Home program is being carried on with continued success. The company's main worry, he said, is the lack of manpower which hampers their certification program, which nevertheless has been progressing well. A wire-on-time plan patterned after programs already in effect in Cincinnati and in Georgia and Alabama cities has been instituted.

Louisiana company encourages 100-ampere minimum service

◆ SOUTHWESTERN Electric Power Company's main sales effort during 1959 will be concentrated on developing the 100-ampere minimum service in the new home market, reports John A. Reed, general sales manager.

The value of such a campaign was shown recently in the Fayetteville - Springdale, Arkansas area, where the company was meeting considerable difficulty in getting building contractors to recommend the use of the 100-ampere service to the prospective home builder.

Experimenting with the use of newspaper and radio advertising in this area, the company conducted a campaign during the month of December to sell the advantages of the 100-ampere service. The results were encouraging enough, Reed said, to warrant the expansion of this campaign during 1959.

An indication of the effects of the concerted advertising effort can be seen in the comments contained in a letter received by Advertising Manager Sam Schwieger from Fayetteville Division Sales Manager H. H. Dalrymple: " . . . We have checked very closely the results of our campaign during the month of December and have found that it exceeded our expectations.

Larger services noted

"The supply houses inform us that they are selling more 100-amp. service switches than 60-amp., and have assured us that it is the result of our advertising program. Our meter department has not connected a single 30-amp. service since two weeks after the campaign started, and very few 60-amp. services have been connected."

To concentrate their efforts on the promotion of adequate wiring, Southwestern Electric has announced the appointment of Don Madden as supervisor of commercial lighting and adequate wiring. His work will be under the supervision of Merchandise Sales Manager W. J. Heinrichs.

During 1959 Southwestern plans also to extend its adequate wiring bureau coverage. The company has five certified bureaus that cover all but the South Arkansas area. This year the Texarkana adequate wiring bureau coverage will be extended to include this territory, and this will bring the entire service area of Southwestern Electric under the certification program.

Commercial wiring

(Continued from page 23)

to overlook anything.

(1) Know your market. Make an analysis of potential customers—get the facts on the extent of their present electrical facilities and their potentials.

(2) Organize a joint industry effort. Convince area colleagues of the potentials of the commercial market and persuade them to go after the modernization business.

(3) Make a plan and follow through. To get results, consistent promotion is of topmost importance.

(4) Use the helps available. The bureau's sales helps are offered to interested persons at less than cost, and contain virtually everything needed to promote, sell, and produce effective results inexpensively.

To further enlist the industry's participation in commercial wiring promotion, particularly the participation of the electrical contractor, the bureau will be represented on the programs of the NECA district meetings during 1959.

Since wiring and lighting so often go hand-in-hand, and, in addition, provide the bread-and-butter for the contractor interested in the commercial field, the bureau has found that it might be to the advantage of the local contractor to combine his rewiring and relighting promotions. The National Lighting Bureau, now conducting its Eye-Fi relighting campaign, has a series of national ads, consumer ads, coupon ads, and promotional ads for local use, plus publicity, prepared talks and slides, training programs, inter-industry information, sales aids, and other materials for a complete relighting promotion program.

USE SOUTHWIRE SINGLE SOURCE SERVICE

A quick glance at Southwire's list of products shows how you can save time, trouble, and money.

You'll find it a simple matter to deal with one source—one order, one bill, one check. And when you order from Southwire, you get Southwire service—the extra that means so much, but costs no more.

A phone call right now will bring our catalog, prices, delivery schedules to your desk.

ALUMINUM • COPPER • STEEL STRAND

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- NM Sheathed Cable
- Cable Accessories

- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

Southwire Company

SOUTHWIRE serves the world

Carrollton, Georgia — TErrace 2-6311

Gibson Ortho 88

PATENT PENDING

THE FIXTURE THAT JUST PLUGS IN

snap - and it's up! **ortho-88**

Made in 48" and 96" lengths for the following lamps:

Rapid Start
Slimline
800 ma R. S.
Power Groove
VHO and SHO

All fixtures, except the 40 w. Rapid Start, are interchangeable on the Uni-Race with all other fixtures of the same length.

4 SIMPLE STEPS

THAT SAVE OVER 75% IN INSTALLATION TIME

Contractors report that all labor, including rods or stems and lamping, for a Gibson Ortho installation averages only 17 to 22 man-minutes per fixture, as compared with the NECA standard of over 2 man-hours for conventional fixtures.

1 **Assemble the Uni-Race** • The exclusive Gibson Raceway known as the Uni-Race can be assembled on the floor in lengths up to 48 feet. The four or eight-foot sections are joined by telescoping couplers which provide a smooth, rigid union of the sections and are fastened with self-tapping screws.

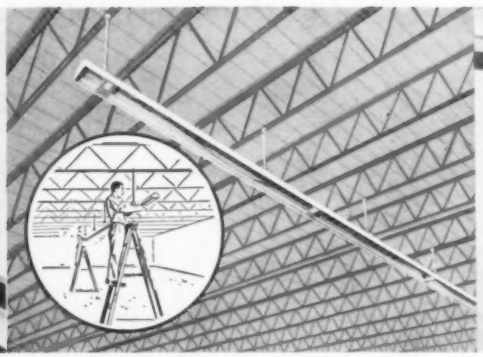
WRITE FOR COMPLETE INFORMATION ABOUT THE GIBSON ORTHO LINE

Gibson LIGHTING

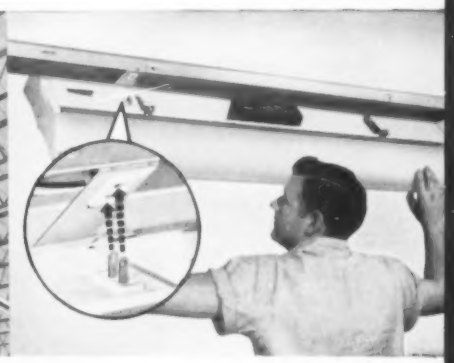
Add, remove, re-space fixtures any time without tools or rewiring

The unique design of the Gibson Ortho, with its exclusive Uni-Race, makes it the world's most versatile fixture. Instead of being wired permanently to the branch circuit, it simply plugs in—like an appliance. A plug built into the fixture engages a receptacle in the Uni-Race, and since the receptacles are positioned at 48″ or 96″ fixture intervals along the Uni-Race, spacing of the fixtures is automatic. They can be mounted in continuous rows or spaced at intervals of 4, 8, 12 or more feet. Fixtures can be added or removed any time, according to the requirements of plant layout. Such changes need no electrical work whatever. They can be made by one man without tools. Think what this saves the owner whenever the lighting layout has to be re-arranged or when a fixture must be removed for repairs or cleaning!

2 Wire the Uni-Race • Branch-circuit wires are laid in the Uni-Race and connection is made at each built-in receptacle. The receptacles will later receive the plug that is built into each fixture. The Uni-Race is U.L. approved as a raceway with a capacity of five No. 8 AWG wires or eleven No. 14 wires.



3 Hang the Uni-Race • The rigid Uni-Race is easily lifted and hung in any of several different ways. Lengths up to 48′ can be hung as a unit if supported every 24′ while being raised to mounting position. When the branch-circuit connection is made, the Uni-Race is ready for the fixtures.



4 "Plug In" the Fixtures • The fixtures are merely "plugged in" on the Uni-Race. Hooks on the fixture engage in slots on one side of the Uni-Race, acting as hinges. The fixture is swung closed and latched. The built-in plug on the fixture automatically connects with the receptacle in the Uni-Race.

GIBSON MANUFACTURING COMPANY

1919 PIEDMONT CIRCLE, N.E. **ATLANTA 9, GEORGIA**

Manufactured in Canada under franchise by Electrolier Manufacturing Co., Ltd., Montreal

Annual meeting of Carolinas NECA Chapter

This article should be especially helpful to the following readers:

Electric Utilities
Electrical Contractors ✓
Electrical Wholesalers ✓
Electrical Inspectors
Industrial Engineers
Consulting Engineers ✓

◆ A NORTH CAROLINA state official has strongly recommended the application of a financial responsibility formula as a licensing requirement for all electrical, plumbing, heating, and air conditioning contractors in the state. The recommendation was made by Frank B. Turner, state property officer, at the annual membership meeting of Carolinas Chapter, NECA, held in Charlotte, N. C., recently.

Mr. Turner's unprecedented remarks constituted only one of several outstanding features of the well-attended program, with Dan Colter of Winston-Salem, North Carolina, Chapter President, presiding at the one-day meeting. Other featured speakers included: C. G. Shockley, president, C. G. Shockley Construction Co., Columbia, S. C., and chairman of the South Carolina Contractors Examining Board; Robert Clemmer of Hickory, N. C., president of the North Carolina Chapter, American Institute of Architects; L. G. Funderburk of Columbia, S. C., executive secretary, South Carolina Electrical Contractors Association; H. L. Elsey of Charleston, S. C., Division of Carolinas Chapter, NECA; William S. Hart, assistant director of foundations, North Carolina State College, Raleigh; Arthur H. Jones, vice-president, American Commercial Bank, Charlotte; and Tom Evans, vice-president, Bennett Advertising Agency.

In his address, Mr. Turner gave, as a suggestion, the following categories for classification of license applicants on the basis of financial responsibility and past performance: Those doing relatively small work license to do up to $5,000 in

(Continued on page 136)

Three principals in the annual meeting of Carolinas Chapter, NECA: (left to right) Chapter President Dan J. Colter, Winston-Salem, N. C.; Vice-President Marshall Walker, Rock Hill, S. C.; District Governor Ralph K. Robinson, Charlotte, N. C.

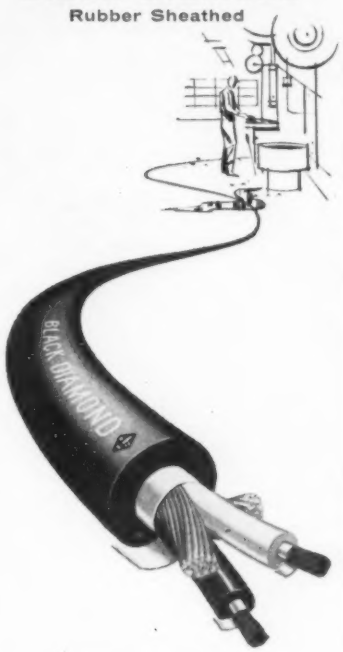
C. G. Shockley, president, South Carolina Licensing Board of Contractors, speaking at the annual meeting of the Carolinas Chapter, NECA.

Diamond has all 3 portable cords

Red-D-Prene®
Neoprene Sheathed

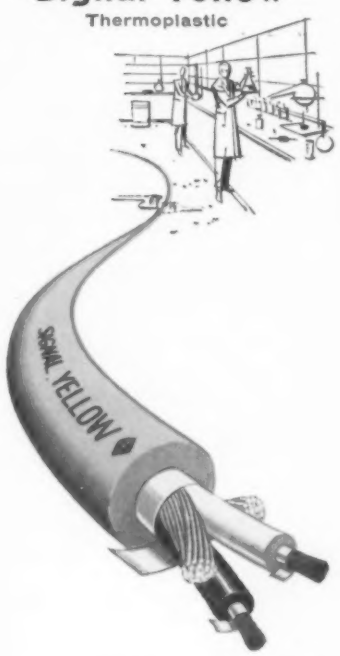
for hot, oily locations

Black Diamond
Rubber Sheathed



for general purpose use

Signal Yellow
Thermoplastic



for all locations where heat is no problem

Red-D-Prene for mill and plant use is designed with tough, oil, heat and flame resistant Type MD (Mill Duty) neoprene jacket in industrial red for ready identification.

Black Diamond has durable rubber jacket protecting against alkalies, acids and moisture. Very flexible construction prevents kinking in service.

Signal Yellow has a jacket of yellow thermoplastic that is quickly seen . . . clean to handle . . . smooth sheath will not readily collect dirt. Easy to pull.

DIAMOND IS ALSO A PRIME SUPPLIER OF

DTW Small Diameter Building Wire

DTX® Non-Metallic White Sheathed Cable

Type SE Service Entrance Cable (Armored & unarmored)

DUF® Type UF

ABC Armored Bushed Cable

Range Cord Sets

Trade Mark ®

DIAMOND
WIRE and **CABLE** Company
Sycamore, Illinois
WAREHOUSE: BIRMINGHAM, ALABAMA

A legal bid depository plan

By A. L. H. Street

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electric Utilities
Electrical Wholesalers ✓
Electrical Inspectors
Industrial Engineers
Consulting Engineers ✓

◆ THE EXTENT to which electrical and other contractors may cooperate in bidding for subcontracts to be awarded by general contractors and government authorities without violating state or federal antitrust laws is indicated by the United States District Court for the Southern District of California in a case decided December 22, 1958.

The case is entitled United States of America v. Bakersfield Associated Plumbing Contractors, Inc., et al. The two additional defendants were a local sheet metal contractors' association and a local electrical contractors' association. For the benefit of their respective members, the three associations have operated a joint bid depository venture in the Bakersfield, California trade area.

The Government sought to enjoin defendants from operating the plan on the ground that, as constituted in 1954, it had the effect of unduly restricting competition in the purchase of supplies moving in interstate commerce.

In an Order filed December 31, 1957, the court condemned certain features of the then existing depository plan, but allowed the defendants to present a modified plan which was fully approved in the decision rendered December 22, 1958.

Through the courtesy of Mr. D. Bianco, of the law firm of Mack, Bianco, King & Eyherabide, Bakersfield, California, we are privileged to present the following report of what was decided. The successful outcome of the suit is largely due to Mr. Bianco, who was chief counsel for the defendants.

The final decision was rendered by Judge Leon R. Yankwich, Chief Judge for the United States District Court for the Southern District of California. Judge Yankwich enjoys a national reputation for outstanding ability as a jurist. This adds to the importance of the decision, which is apt to have a persuasive effect upon courts in other state and federal jurisdictions where any similar case may arise.

Summary of the decision

The opinion defines "construction supplies" as including plumbing, heating and ventilating, sheet metal, and electrical supplies which are furnished by subcontractors under construction contracts. "Bid depository" is defined as "a facility through which the bids of subcontractors are received and processed, and made available to general contractors in accordance with rules for the operation of such bid depository."

The court enjoined defendants from:

"(b) Adopting, enforcing, or continuing in effect, any of the provisions of any rule for the operation of a bid depository which

(i) requires the submission of separate bids for plumbing, or separate bids for heating and ventilating;

(ii) Attaches any condition with respect to the price at which any combination bid for plumbing and heating and ventilating may be submitted;

(iii) requires that subcontractors who have been awarded contracts as a result of bids deposited at such bid depository shall pay any fees which, in the aggregate and in combination with any other fees collected pursuant to any such rule, are in excess of the amount reasonably required for the operation and maintenance of such bid depository;

"(c) coercing, inducing, or attempting to coerce or induce, any contractor who has submitted a bid through a bid depository operated by defendants, or any of them, to withdraw such bid after it has been opened, announced, or published at such bid depository; and

"(d) soliciting, receiving, or accepting money or any other things of value as an inducement to the withdrawal of any bid submitted through a bid depository operated by the defendants, or any of them, after it has been opened, announced, or published as such bid depository."

The defendants were ordered and directed:

"(a) to open in public at the office of any bid depository operated by the defendants, or any of them, a copy of each bid received at such bid depository, and to announce or publish such bid to those present at such bid opening at least six hours prior to the time specified by the awarding authority for the opening of general contractors' bids, and two hours prior to the time when the sealed bids received at such bid depository are available to the general contractors to whom they are addressed;

"(b) To notify all general contractors and subcontractors known to be interested in bidding on any project through which bids have been or are invited to be received at a bid depository operated by the defendants, or any of them, of the time when such bids will be opened at such bid depository; that such bids shall be opened under the conditions specified in paragraph IV A (a) hereof and that they are at liberty to attend; and

"(c) to notify all general contractors and subcontractors who in the past have taken bids from, or placed bids with, a bid depository operated by the defendants, or any of them, that bid openings are to be conducted under the conditions specified in paragraph IV A (a) hereof, and that they are invited to attend such openings."

The court decided that the method of operating a bid depository as outlined in new rules adopted by defendants "does not violate the anti-trust laws of the United States."

Wanted: Manuscripts for publication

The editors of Electrical South will welcome contributions from the field for publication. Electrical contractors, consulting electrical engineers, light and power company engineers, and others closely associated with the electrical industry are invited to submit articles, photographs, and drawings relating to important and interesting electrical projects in the South and Southwest.

Articles are wanted in two principal classifications:

Wiring and Lighting: **Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

Utility Engineering: **Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

Address all communications to the editor:

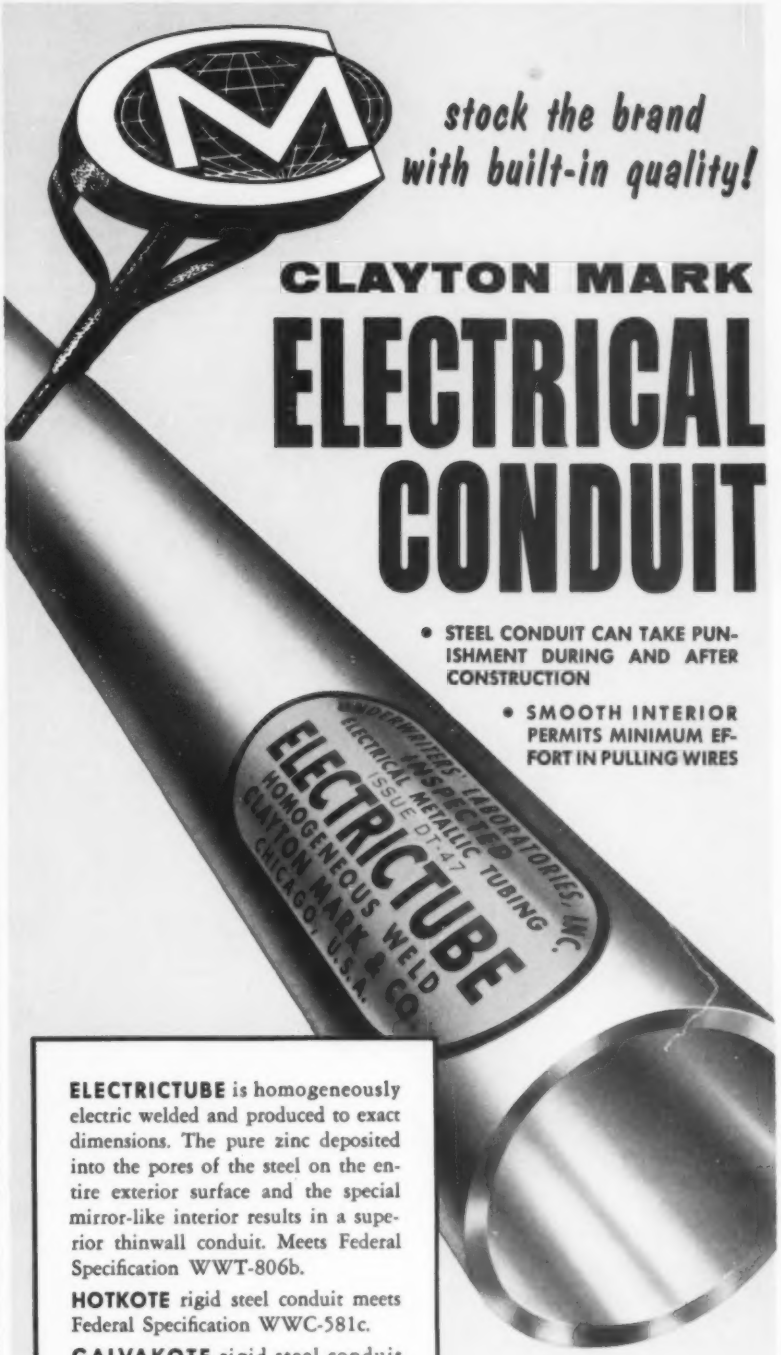
Electrical South
806 Peachtree,
Atlanta 8, Ga.

stock the brand with built-in quality!

CLAYTON MARK

ELECTRICAL CONDUIT

- STEEL CONDUIT CAN TAKE PUNISHMENT DURING AND AFTER CONSTRUCTION
- SMOOTH INTERIOR PERMITS MINIMUM EFFORT IN PULLING WIRES



ELECTRICTUBE is homogeneously electric welded and produced to exact dimensions. The pure zinc deposited into the pores of the steel on the entire exterior surface and the special mirror-like interior results in a superior thinwall conduit. Meets Federal Specification WWT-806b.

HOTKOTE rigid steel conduit meets Federal Specification WWC-581c.

GALVAKOTE rigid steel conduit meets Federal Specification WWC-581c.

ENAMELKOTE rigid steel conduit meets Federal Specification WWC-571a.

Each length contains Underwriters' Laboratories label and meets NEMA specifications.

CLAYTON MARK & COMPANY
1900 Dempster Avenue • Evanston, Illinois

The complete text of the approved depository plan follows:

Construction Industry Bid Depository Plan

(1) **Purpose:** These rules are established for the purpose of providing fair and open competition between the members of the plumbing, heating and ventilating, sheet metal and electrical industries and to eliminate the unfair practice of bid peddling.

(2) **Applicability:** The rules herein established shall govern any proposal, tender or offer to contract the installation of plumbing, heating and ventilating, sheet metal or electrical, upon all projects within the Counties of Kern, Inyo and Mono for the plumbing, heating and ventilating, and sheet metal industries, and the County of Kern for the electrical industry, wherein the awarding authority has designated and advertised a specific time for the opening of contract bids for the performance of work upon said project by a user of the bid depository or member of the associations.

(3) **Depository:** To achieve the objects of this agreement, the Bakersfield Associated Plumbing Contractors, Inc., Kern, Inyo and Mono Counties. Sheet Metal Contractors Association, Inc., and the Kern County Electrical Contractors Association, Inc., hereinafter referred to as the associations, will establish and maintain a bid depository at 1421 - 24th Street, Bakersfield, California. The bid depository box shall be equipped with two locks; the first two persons depositing bids on any specified project that will be present for the opening of such bids will lock the depository box and retain the keys thereto; upon the specified time for the opening of such bids, the persons retaining the keys will unlock the box; all bids will then be publicly announced and tabulated by the respective associations' secretaries.

(4) **Deposit of Bids:** The bid depository maintained by the associations shall be available to all plumbing, heating and ventilating, sheet metal and electrical contractors desiring to bid upon the designated project.

(5) **Time of Deposit:** All bids must be received by the depository normally not later than six hours prior to the time designated for the opening of bids by the awarding authority; provided, however, that if the time designated by the awarding authority for opening bids is such that deposit six hours prior thereto would not be during normal working hours, then the Board of Directors of each association shall coordinate and designate the time at which bids must be deposited; in the event of time designation by the association Board of Directors all bidders known to be interested in bidding the project shall be notified sufficiently in advance of the time of deposit by the office of the depository. Bids received later than the time hereinabove provided shall be returned to the bidding contractor unopened.

(6) **Combination Bids:** Contractors submitting bids to the depository may submit separate bids for plumbing, heating and ventilating, sheet metal and electrical work, and may submit a bid representing a combination of all or any two or more thereof. All bids are to be submitted to the depository upon the condition that either the plumbing, or heating and ventilating, or sheet metal or electrical portion of any bid may be used by the general contractor with any other plumbing, or heating and ventilating, or sheet metal or electrical bid or portion of a bid submitted through the depository. Any bid purporting or attempting to restrict such use in combination with other depository bids shall be invalid.

(7) **Bid Opening:** The procedure for submission and opening of bids shall be as follows:

A. To assure uniformity of bids, all bids must be submitted upon the bid forms supplied by the depository; forms will be mailed by the depository to all contractors indicating an intent to bid the project; bids not submitted upon the depository bid form will not be recognized.

B. Bidders shall submit to the depository a separate, sealed bid addressed to each general contractor with whom the bidding contractor intends to bid, and shall submit an additional bid addressed to the depository.

C. Bids addressed to the depository will be opened at 1421 - 24th Street, Bakersfield, California, six hours prior to the bid opening of the awarding authority, unless a different time has been designated in Paragraph 5; bids will be opened at such time solely for the purpose of determining whether the bids conform to depository requirements; bids so opened shall not be deemed an offer to any general contractor at the time of such opening.

D. Bids addressed to the general contractors shall be available to the general contractors two hours following the opening of bids addressed to the depository; provided, however, that no bid shall be delivered to a general contractor until said contractor has agreed in writing to accept the bid if it is the low bid accepted through the depository.

E. Bids shall be opened, in public, and all general contractors and subcontractors, known to be interested in bidding on the project, shall be notified that they are at liberty to attend and witness the opening of bids; likewise all general contractors who have in the past taken bids from the depository shall be notified in writing by the secretaries of the respective associations, that bid depository openings are open to the public and that they are invited to attend all bid openings.

(8) **Depository Fee:** The successful bidder or bidders shall pay to the depository fund, as a depository fee, a sum equal to one-half of one per cent (½ of 1%) of the contract awarded to each bidder for plumbing, one-half of one per cent (½ of 1%) of the contract for heating and ventilating, one-half of one per cent (½ of 1%) of the contract for sheet metal and one-half of one per cent (½ of 1%) of the contract for electrical; provided, however, that the depository fee pertaining to any one of the aforementioned subcontracts shall not exceed $250.00. The depository fee shall be paid at the time the contractor receives the first payment on the contract. A contractor failing to pay the required depository fee within thirty (30) days of the date specified herein shall be denied the privileges of the depository until the fee has been paid.

(9) **Collection of Delinquent Fees:** In the event of litigation to collect a delinquent depository fee, or to collect a delinquent withdrawal fee, the delinquent contractor shall pay all attorneys' fees, costs of suit, and other expenses reasonably incurred in connection with such litigation.

(10) **Reopening of projects:** When bids for a specified project are once opened, there shall be no further bidding on said project for a period of one hundred twenty (120) days by contractors who did not bid such project in the first instance unless the plans and specifications have been revised in an amount exceeding twenty-five per cent (25%) of the work and/or materials prescribed in the original plans and specifications.

(11) **Conditions of bid:** All plumbing, heating and ventilating, sheet metal and electrical bids shall be submitted upon the condition that the bid may be used only in combination with a plumbing, heating and ventilating, sheet metal or electrical bid which has been submitted through the depository. Said condition of bid will be printed upon the bid form provided by the depository.

(12) **Withdrawal of bid:** The procedure for withdrawal of a bid shall be as follows:

A. Any bid in the depository may be withdrawn, without penalty, at any time prior to the opening of bids as outlined in Paragraph 7 hereof.

B. After the opening of bids as outlined in Paragraph 7 hereof, a bid may be withdrawn prior to the time that bids are made available to the general contractors; provided, however, that a bid may be withdrawn at that time only upon payment of one per cent (1%) of the total amount of said bid, said penalty not to exceed $1,000.00. Payment of the penalty herein provided must be made within ten (10) days of the withdrawal. Notification that a bid is to be withdrawn must be made by the contractor or his agent.

C. In the event that a bid is not withdrawn prior to delivery to the general contractor, the bid shall become an irrevocable offer to the general contractor and shall not be withdrawn thereafter; the consideration for the option herein provided shall be the execution by the general contractor of the agreement to accept low bid at the time of receipt of the subcontract bid.

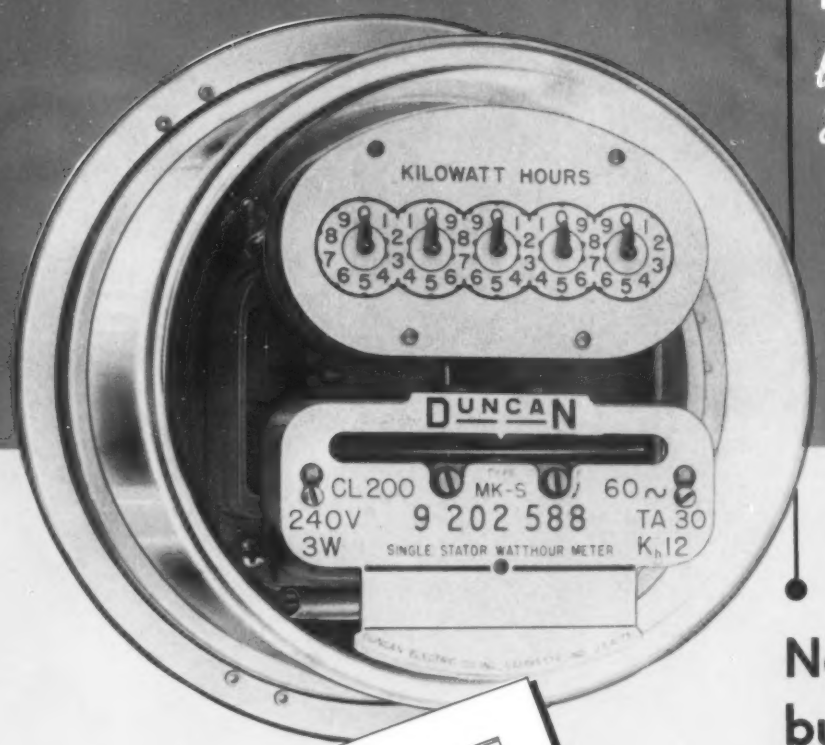
(13) **Naming of subcontractors:** In the event that any plumbing, heating and ventilating, sheet metal, or electrical contractor intends to subcontract a part of his bid to another contractor signatory to this agreement, such contractor shall designate the name of said subcontractor to be used by him on the bid form; subcontractors so named shall not be changed thereafter in the absence of showing good cause therefor.

(14) **Recordation of bids:** All bids submitted through the depository shall be accurately recorded and placed on file in the office of the de-

(Continued on page 136)

MORE CAPACITY *Per Dollar!*

Class 200 Ratings *for More Housepower!*

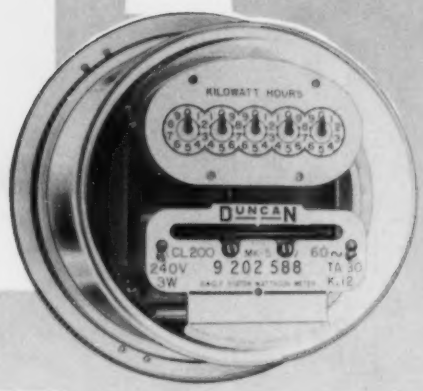


Now your dollar buys more Metering Capacity!

DUNCAN

Concentrates on Metering Equipment —the attention of the entire Duncan Organization is devoted to your metering requirements.

"Thinking Ahead . . . Moving Ahead . . . to stay Ahead of Demand!"



TYPE MK— SINGLE PHASE METERS

are available in three classes: 10, 100, and 200

The class of each represents the maximum current for each rating, i.e., 10 amps., 100 amps., and 200 amps. They represent the latest carefully engineered product in a long line of Duncan developments and are built to accurately meter a wide range of loads from a few watts to a full 200 ampere. The damping magnet system is composed of two high energy Alnico magnets positioned above and below the disc, which provide calibration stability and substantial freedom from tilt error. Arc-resistant insulation and self-contained arc gaps to by-pass electrical disturbances protect the MK from insulation failures.

Simplification of design provides for a minimum number of parts —improving reliability—reducing necessity for repairs—but making any maintenance convenient. A three position cover ring, separate worm wheel with mesh independent of the register, and adjustments operated from the front, make this "Meterman's Meter" convenient to calibrate and maintain.

MEET INCREASING LOADS

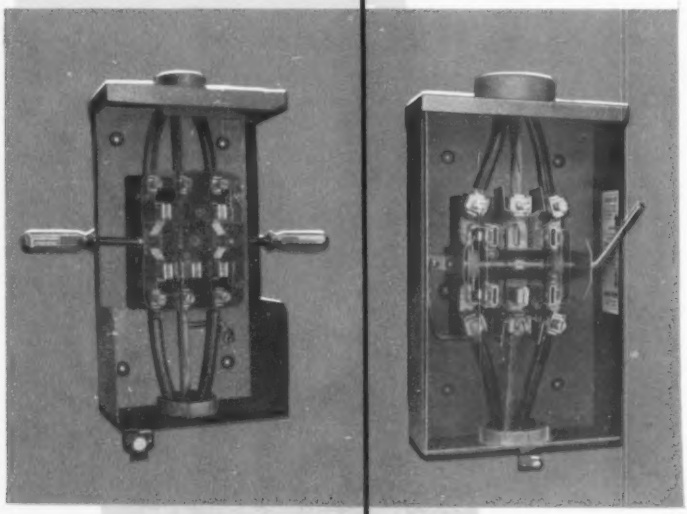
With Extended Range Single phase meters and Mounting Devices with 200 Amp. Capacity

HQ-5 *(Below)*

For Commercial or "High load factor loads" up to 200 Amp. capacity

MD-5

For residential or "low load factor loads" up to 200 Amp. capacity



LIVE BETTER ELECTRICALLY WITH FULL HOUSEPOWER

DUNCAN ELECTRIC CO., INC.

Lafayette, Indiana.

UTILITY ENGINEERING

Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance

Photo Credit Page 75

Transmission substation grounding practices—page 68
Distribution system protective equipment application study—page 71

DEVELOPED TO MEET YOUR NEEDS:

A COMPLETE LINE OF

for all your installation

CLASS 200 | **CLASS 100** | **CLASS 10**

Sangamo Type P Meters offer unusual economies with accurate measurement.

Available now for all polyphase loads. The meters start at 18 watts—operate continuously at 96,000 watts.

You can calibrate in half the time. There are up to four fewer adjustment points. In addition to micrometer power factor adjustment, the P2 Meter has only three adjustments—full load, light load, and balance.

You save money in glass covers. These meters are the only polyphase meters small enough to use your standard metal base singlephase meter covers.

You have greater surge protection. Current windings are encapsulated in high strength epoxy resin insulation. Both current and potential coils have breakdown in excess of a 15 KV surge.

You gain economy through slow speed. Reduced series damping and fewer revolutions just naturally mean greater accuracy and better performance.

SANGAMO ELECTRIC COMPANY

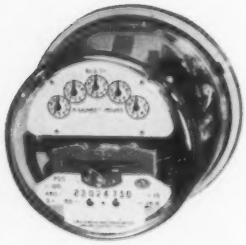
SPRINGFIELD, ILLINOIS

JM59-4

LIFETIME GUARANTEED SANGAMO TYPE P METERS FOR

Class 200 4 wire, 2 stator Delta

Class 200 4 wire, 2 stator Wye

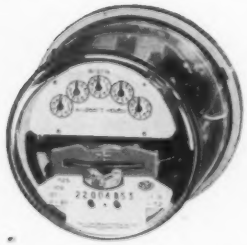


Class 100 2 stator Network meter

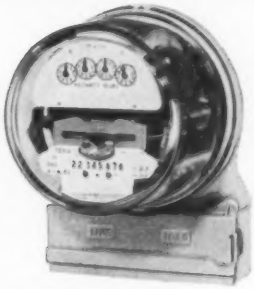
POLYPHASE METERS

requirements...

ALL POLYPHASE MEASUREMENT



Class 100 3 wire, 3 phase, 480 v.

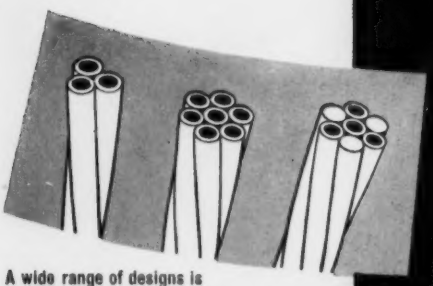


Class 10 4 wire, 2 stator Delta

The potential coil can be removed and replaced without disassembling other components. *Replacement time is cut in half.*

50TH ANNIVERSARY SANGAMO 1899 - 1949

NOW . . . a NEW



A wide range of designs is
both useful and economical

overhead ground wire

Exclusive features—

a **thick cladding** of aluminum
a controlled **atomic weld**

Give your transmission lines positive and permanent protection with the new light-weight, low-cost Alumoweld Overhead Ground Wire. It's the only aluminum-covered steel wire with a thick cladding of aluminum and the only one made by the controlled atomic-weld process.

Not only does Alumoweld have the strength of steel wire, but because of its 25% by area aluminum covering, it offers the added advantages of much higher conductivity and far greater service life. In fact, Alumoweld has corrosion resistance equal to solid aluminum wire, has one third the conductance, and eight times the strength. Just about optimum values for an Overhead Ground Wire!

In Alumoweld Overhead Ground Wire, you get three important benefits. (1) Its thick aluminum covering permanently protects the high-strength steel core against corrosion. (2) The electrical conductance is excellent for relaying and for discharging lightning and transient currents to ground. And, (3) Alumoweld's high strength permits stringing for ample mid-span clearance. Together, these add up to long-life protection and reduced service interruptions for your transmission lines.

For more information, write today for Engineering Bulletin E.D.3000.

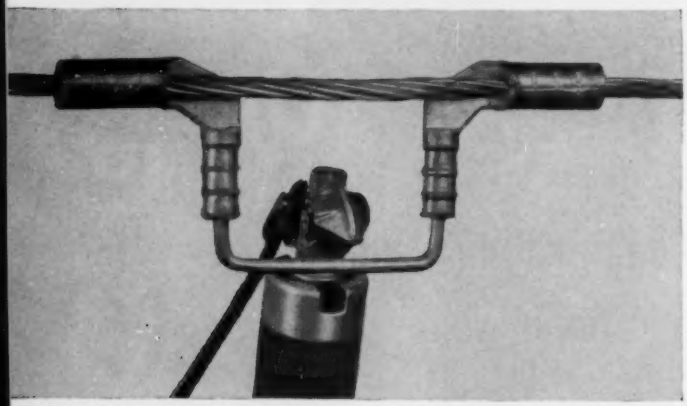
ALUMOWELD

PRODUCT OF COPPERWELD STEEL COMPANY, WIRE AND CABLE DIVISION, GLASSPORT, PA.

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Kearney's compression program

Added versatility and increased application with existing tools—that's what an investment in Kearney Compression can mean for your system. Besides the basic connections—Squeezons, Serv-En Service Entrance Sleeves, Tension Sleeves and others—you receive the advantages of ever widening tool flexibility as Kearney Engineers continue to develop and introduce new Compression Fittings to the field.

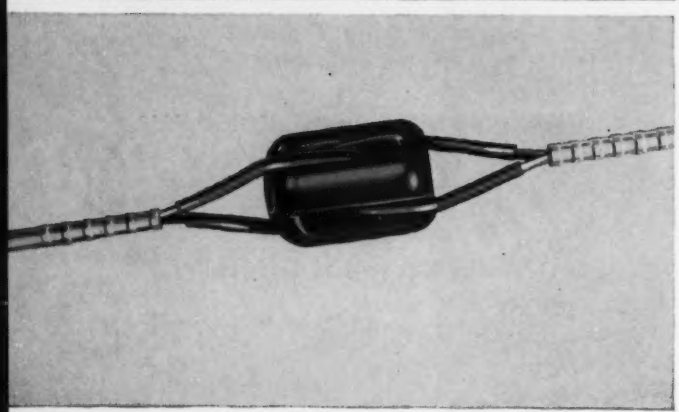


KEARNEY L Squeezon Stirrup

Line side connections are outside the basket—sufficient clearance for either the hydraulic or mechanical tool. The three inch dimension between the line and stirrup makes the unit neat and compact—hot line clamps are readily installed. Unit may be completely covered with line guards.

KEARNEY Compression Terminal

Kearney Compression Terminals provide an efficient method of connecting aluminum conductors to terminal pads. Flaring of strands possible with conventional terminal pads is eliminated. The strands are retained in an aluminum sleeve. Terminals have NEMA 1¾" bolt centers. May also be used as disconnectable jumpers around double dead-ends. The sleeves are filled with Kearnalex Contact Aid and capped and will take conductor sizes from 1/0 to 397.5 MCM 18/1 ACSR.



KEARNEY Insulated Splice

The Insulated Splice was designed primarily for splitting secondaries into shorter sections where additional transformers have been installed and for series street lighting applications. No changes in existing construction are required. Designed for copper, aluminum and ACSR connections, this splice features one piece construction, tension-type sleeves, insulated stainless steel bails and a high strength strain insulator. Splice can be installed with Kearney Hydraulic or Mechanical Tools. ACSR and aluminum sleeves are packed with Kearnalex Contact Aid and plastic capped.

391

pays extra dividends

KEARNEY INSIDE TAPERED COPPER SLEEVE

A completely new, cost-cutting design—another Kearney "dividend"—permanent, positive, full tension splicing of energized conductors with standard Kearney tools and dies.

ADVANTAGES—

1. **Metallizing process**—copper sleeve is sprayed internally with conductive metal to assure maximum holding power and high conductivity.
2. **Full Inside Taper**—design assures ease of insertion of hot conductors—also relieves stress, due to vibration, at the extremities of the sleeve.
3. **Shorter Length** means less installation time, fewer crimps and no sacrifice of holding power—sleeve is more easily stored.
4. **Clearly marked** with conductor and die sizes.

KEARNEY WH-1 TOOL

A rugged, reliable hydraulic tool which expedites the installation of Kearney compression fittings and sleeves. Hi-speed, two-valve pump permits fewer strokes for full compression—exerts 21,000 pounds thrust. The narrow "C" head permits full visibility of the working area. Balanced weight enables the lineman to position the tool quickly and accurately for each indent. Interchangeable, insulated wood handles with extra length are available for working higher voltages.

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

Specify Kearney Products

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

SEE AND HEAR
the dramatic story of
SINGLE-VENT SMALL-BORE
CUTOUT OPERATION

See the new 16mm sound and color movie "The Hubbard EHD Faultmaster" right from your own desk chair. Film time: ten minutes.

Watch the Hubbard EHD Cutout clear faults throughout the range without "null operating points"—see closure on a fault, dramatizing conclusively the *positive protection* and *safe operation* provided by the Single-Vent Small-Bore fuse cutout.

Through the use of ultra slow-motion photography, you see the fuse link melt right before your eyes...you see gases generated within the fuse tube and discharged downward and away in a single confined cone—eliminating the possibility of damage to overhead construction. You see the results of research leading to the industry's first Single-Vent Small-Bore Cutout in the extra heavy duty range.

Write the Advertising Department, Hubbard and Company for information.

No screen is needed, no threading, no rewind, no darkened room. Just plug it in and watch. Filmed at the Hubbard Electrical Research and Development Laboratory.

HUBBARD

AND COMPANY • 200 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

Five distinctive features

make this new VIRDEN Commercial Fixture

Your Best Buy!

1. **Easy to maintain**
   Removable side panels. No tools required. Suspended units can be relamped from above or below. Safety chain suspends louvres out of the way, freeing both hands for maintenance.

2. **Simplified continuous row installations**
   3/16″ matching K.O's. in end plates eliminate connectors. Rectangular K.O's. provide extra large wireway for easier wiring. For stem mounting, mounting plates have preset screws, slip into key holes in channel.

3. **Complete mounting accessories**
   Including rigid and swivel stems plus special 1½″ on-ceiling outlet box to comply with national code.

4. **Choice of 35° x 25°, 35° x 45°, or 45° x 45° shielding**
   Available in metal or polystyrene plastic side panels.

5. **Virden quality throughout**
   Die stamped steel. Bonderized finished in white high-baked enamel.

VIRDEN Lighting

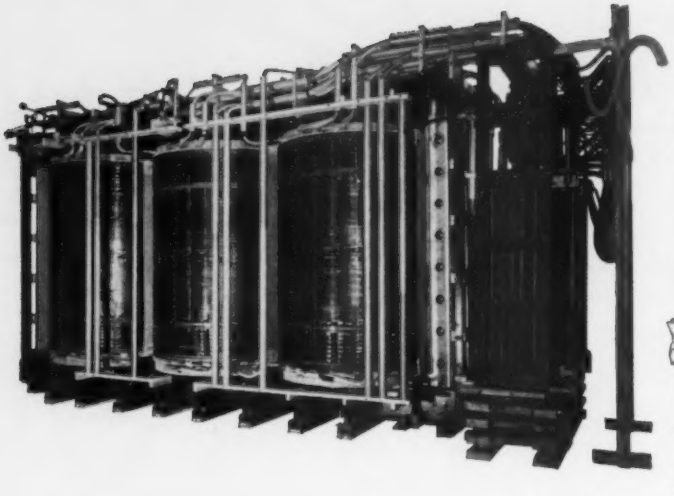
The new Virden Commercial fixtures meet all present day standards for school lighting. Also ideal for offices, stores, commercial installations. Available in 2-light rapid start and slimline, 4 and 8 foot lengths. Also in 4-light tandems, rapid start, 8 foot lengths.

See them at your Virden distributors now! Or write for Form No. 146 to Virden Lighting, Dept. ES, 5209 Euclid Ave., Cleveland 3, O.

Find Your Nearest Dealer In The Yellow Pages

VIRDEN LIGHTING . . . Division of John C. Virden Company • Cleveland 3, Ohio

Member American Home Lighting Institute



The completed core-and-coil assembly showing the main, series and reactor transformers.

Note the substantial framework, the method of insulating and supporting the leads and the quality of workmanship, all of which are inherently a part of Moloney transformers.

Recently shipped to Consolidated Edison Co., of New York: two 100,000 KVA, 138 KV transformers designed to maintain proper voltage on the Consolidated Edison, Staten Island System

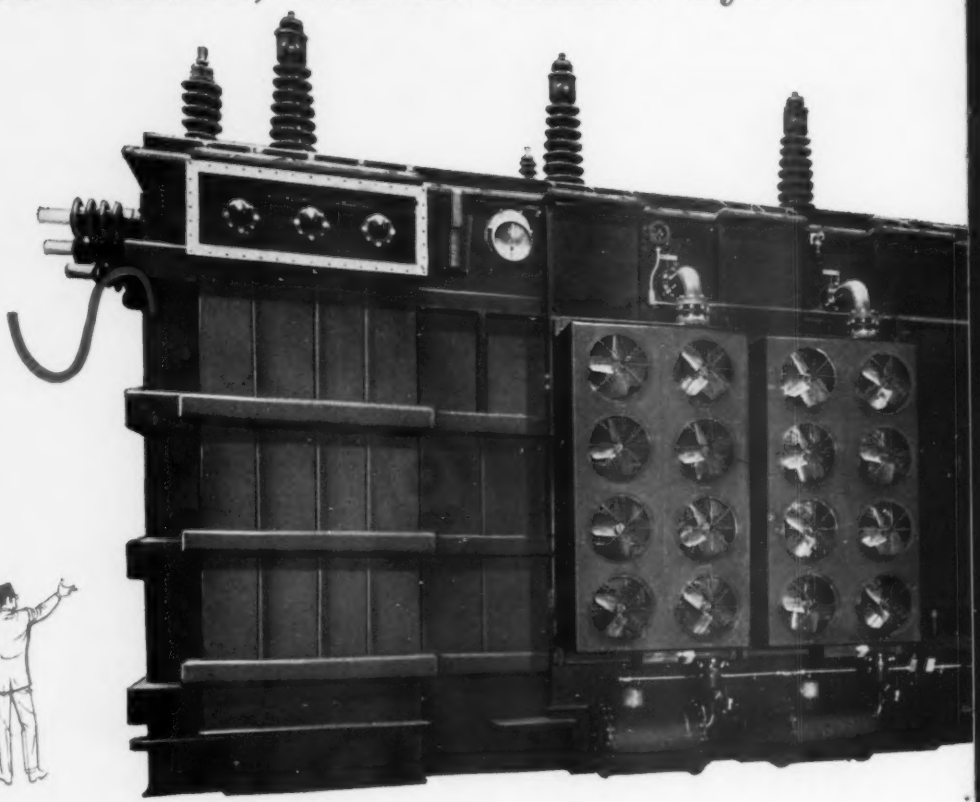
Low voltage side of a three phase, 60 cycle, LTC transformer, type OA/FA/FOA rated:

60,000/80,000/100,000 KVA

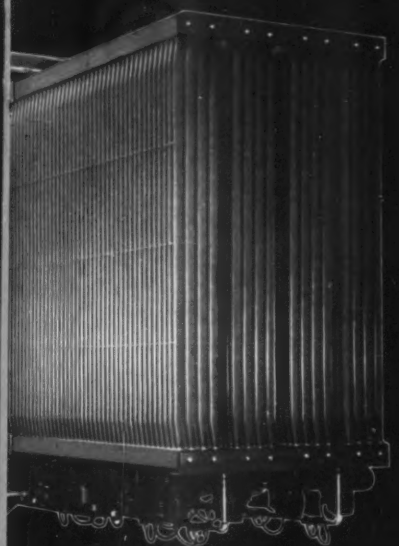
–High Voltage: 132,000 Volts

–Intermediate Voltage: 35,000Y/20,200 Volts

–Low Voltage: 13,800Y/7960 Volts at 12,000/16,000/20,000 KVA



These Tie Feeder Transformers for Consolidated Edison's Arthur Kill Generator Station, Unit #2 located on Staten Island will be connected to the Consolidated Edison System by 138 KV cables under the narrows to Brooklyn, N. Y.



These units are 60,000/80,000/100,000 KVA, three phase, sixty cycle, type OA/FA/FOA transformers rated as follows: high voltage 132,000 volts, intermediate voltage 35,000Y/20,200 volts, low voltage 13,800Y/7960 volts at 12,000/16,000/20,000 KVA. They are equipped with load tap changing equipment in the 35 KV intermediate winding for plus or minus 12% regulation to provide regulated voltage for the Staten Island load.

The 13.8 KV winding is designed to provide start-up auxiliary power for Arthur Kill Generating Station, Unit #2, which has a rating of 335 MW. To stabilize the voltage of the intermediate winding due to this start-up load on the low voltage winding, a zero or slightly negative impedance is utilized in one branch of the equivalent impedance diagram.

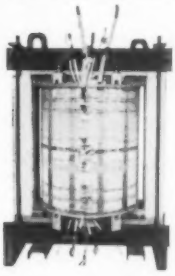
Due to the complexity of this design, Moloney built and tested a prototype to obtain the best possible design. The tests conducted on the prototype included tests to determine surge voltage distribution and impedance.

Another feature of these units, which was specified by the Consolidated Edison Company, is that they have a sound level considerably below the standard NEMA level.

Moloney Power Transformers are available in all voltage and KVA ratings in special or in standard designs. Contact your Moloney representative for information on any size or type transformer . . . Specify Moloney Transformers . . . All Along the Line.

MED9-1

MOLONEY ELECTRIC

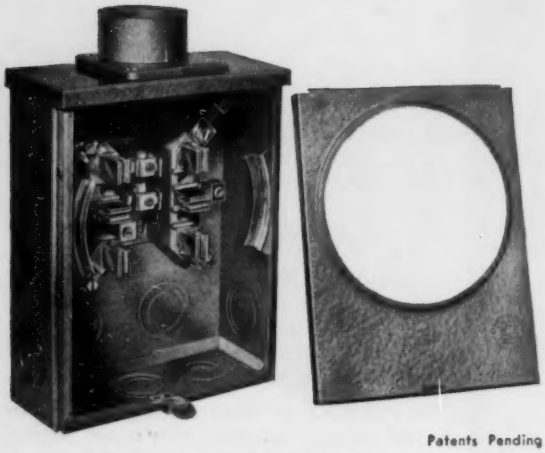


Prototype of windings, used to determine surge voltage distribution and impedance.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA



Patents Pending

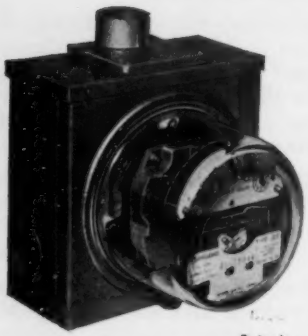
CATALOG-WVL-0175A-2"
SIZE 10½" x 8" x 3⅝"
175 Ampere Capacity
3-Gang Ground, 5th and 6th Terminals
Added Line Terminals for connection to other sockets

listen

. . . to what they are saying . . .

QUALITY WITHOUT QUESTION
REVOLUTIONARY – UNIQUE
FULLY TESTED & THOROUGHLY TRIED

ENGINEERED TO PROVIDE ALL THE ADVANTAGES YOU WANT AND NEED



Patents Pending

CATALOG-WV-011-A-1¼"
Size 8" x 8" x 3⅝"
Up to 100 Amp. Capacity

Positive corrosion protection . . . the complete enclosure is provided with a nonabsorptive oxide film after fabrication, then finished in a hard, durable, baked-on grey Hammertone Enamel . . . unexcelled performance!

B & C's

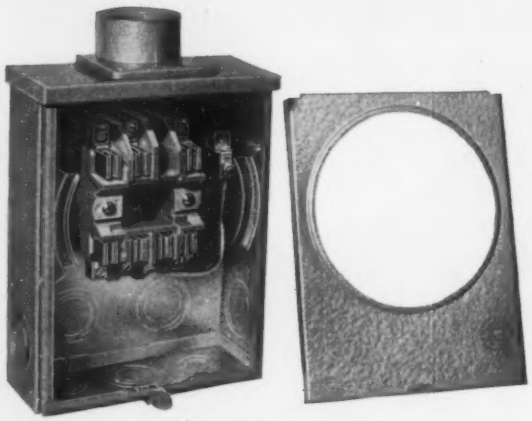
RINGLESS METER SOCKETS

. . . available in . . .

Light Duty
Medium Duty
Heavy Duty

Patents Pending

CATALOG WVL-0150A-2"
Size 10½" x 8" x 3⅝"
Up to 150 Amp. Capacity



Patents Pending

CATALOG WVL-1007-A-2"
Size 10½" x 8" x 3⅝"
7-Terminals — 100 Amp. Capacity

No Sealing Ring required! New Snap Latch sealing device. Interchangeable conduit hubs, and many additional flexible features. Stainless steel sealing latch and stainless rivets eliminates electrolytic deposits. Unique hinge terminals, pressure plate design, 4/0 capacity—straight-thru single or 3 gang terminals—5th and 6th terminals—semi-automatic visible by-pass—and many other features. . . .

Write for descriptive catalog containing installation data and current price list.

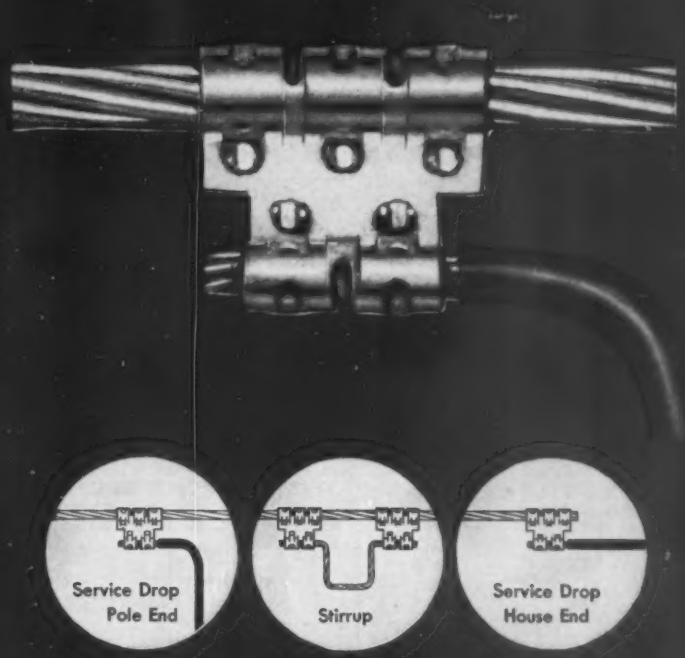
B and C

Your Seal of Dependability and Safety

METAL STAMPING COMPANY

590 MEANS ST., N. W. • ATLANTA, GEORGIA

The TAP that TOPS them all...



THE MULTI-PURPOSE AMP UTILI-TAP for aluminum and/or copper conductors

Tired of all the expensive clutter in your stock rooms—a special tool for this, a special piece of hardware for that? Now you can clear out a lot of your inventory clutter with all new A-MP UTILI-TAP

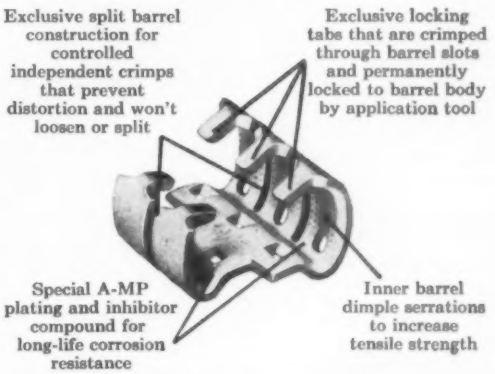
Here is a product that can be used on diverse tapping installations—like no other product on the market. It's permanent, it's sure and it will do many, many jobs.

Your stock can be simplified and easily maintained. Your linesmen can now go up the pole without pockets filled with miscellaneous parts or belts loaded with special tools. Simplify with the A-MP UTILI-TAP

Light-weight matched tooling available in mechanical or hydraulic types.

The only tap on the market that converts from an easily attached open barrel construction to a permanent, closed barrel attachment.

Look at these unbeatable features:


Exclusive split barrel construction for controlled independent crimps that prevent distortion and won't loosen or split
Exclusive locking tabs that are crimped through barrel slots and permanently locked to barrel body by application tool
Special A-MP plating and inhibitor compound for long-life corrosion resistance
Inner barrel dimple serrations to increase tensile strength

Full range of wire size combinations for aluminum, copper or ACSR conductors.

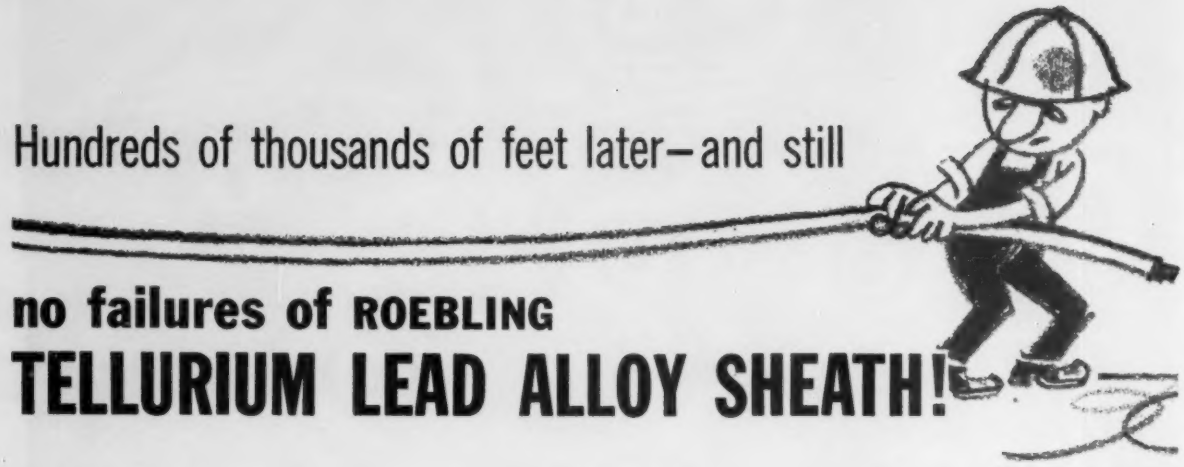
Send today for more information to solve your tap inventory and reliability problems simultaneously.

American Pamcor, Inc.

GENERAL OFFICES: 181 HILLCREST AVE., HAVERTOWN, PA.

Exclusive Distributor For AMP Products To The Utility Industry

Hundreds of thousands of feet later—and still



no failures of ROEBLING TELLURIUM LEAD ALLOY SHEATH!

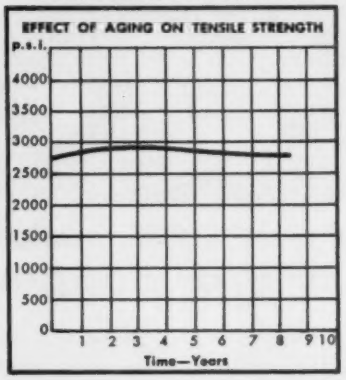
More proof: Tensile strength and elongation remain virtually unchanged, after eight years aging.

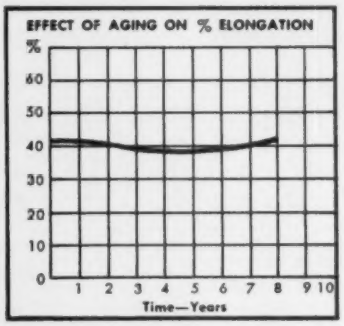
The first Roebling Paper Power Cable with the extraordinary Tellurium Lead Alloy Sheath went into service over five years ago. Since then hundreds of thousands of feet have been put to work. The record? Not a single failure! This remarkable record of service on energized circuits proves conclusively that Roebling Paper Power Cable with Tellurium Lead Alloy Sheath gives you maximum service, with maximum savings!

What's more, we asked the people who bought this cable to put it into the toughest service possible—in such installations as high risers, grades and underground installations where large cable movements and high temperatures prevail. And this gruelling service bears out what we've always maintained: Roebling Tellurium Lead Alloy Sheath has long term stability when it comes to tensile strength and elongation, high resistance to creep and bending fatigue.

These graphs of laboratory tests show effect of aging on tensile properties of Tellurium Lead Alloy Sheath.

TELLURIUM LEAD ALLOY SHEATH...

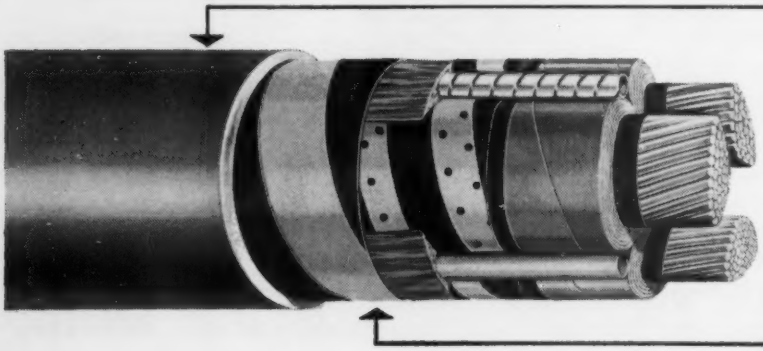




The exceptional quality of this sheath is one reason why Roebling has more Tellurium Lead Paper Power Cable in service than any other manufacturer. *Another* reason is the superb *inner* quality of this cable. Every step of construction represents scrupulous care. The paper tapes, for instance, are applied under uniformly controlled tension, to assure maximum insulation qualities. And every inch of the cable is tested—then tested again.

You benefit in all kinds of savings—not the least of which is *money*—when you put Roebling Paper Power Cable with Tellurium Lead Alloy Sheath into service! Don't you owe it to yourself, and your company, to find out more? An interesting, profusely illustrated book is yours free. Write for your copy ...right now! Ask for Technical Bulletin 205-C. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation



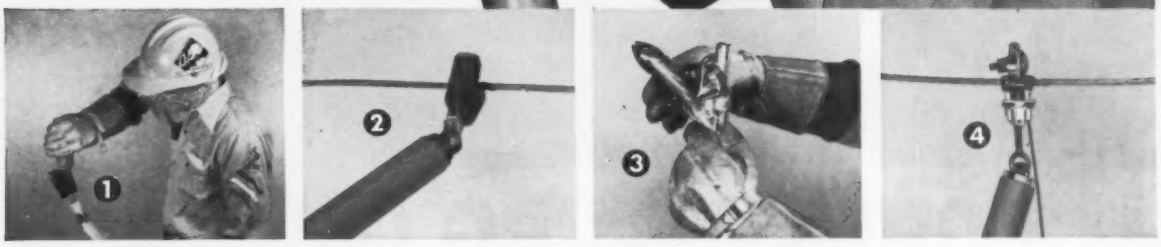
Uniform physical properties are easily achieved in a single operation with the tellurium alloy. This unique feature is but one of several which distinguish the tellurium alloy from other fatigue-resistant lead alloy sheaths.

Mammoth new taping and cabling machines, and the finest obtainable materials, are used to produce the carefully constructed "heart" of Roebling Paper Power Cables.

Here's the clamp to use for Hot Line Taps...

"I've worked with hot stick crews in many parts of the world and I've seen quite a bit of conductor damage due to poor connections. You can take my word for it, Chance PC Hot Line Clamps have what it takes to protect these important spots on your circuits. They have extra-wide jaws that are easy on the conductor and contact all outside strands... they can take thermal expansion and contraction and still hold tight... and they'll never 'freeze' on the line."

O. G. (Andy) Anderson
Product Manager, Tools—A. B. Chance Co.



...and here's the way to get a lineman's cooperation in making trouble-free connections

Make it as easy as possible to apply clamps with **z.l.n. 100** by buying Chance clamps packaged with this *Contact Aid* pre-applied. Our engineering research and our experience with many utilities has taught us that Chance **z.l.n. 100** *Electrical Contact Aid* and a wire brush are the first requirements in making a long-lasting hot line tap. 1. Apply **z.l.n. 100** *Contact Aid* to the conductor cleaning brush. 2. Wire brush the contact area of the conductor to remove surface oxides and to apply the corrosion inhibiting *Contact Aid*. 3. Remove the plastic package from a Chance "Protected Connection" Clamp—(the *Contact Aid* is pre-applied to a factory-clean clamp). 4. Install the clamp—It's specially engineered for hot line taps that will let you give your customers continuous electrical service without danger of burn-downs and allow you to easily remove the service if necessary.

Chance "Protected Connection" Type PC Clamps are available in a complete range of sizes that can take from No. 6 ACSR to 1,431 MCM ACSR and comparable sizes of copper conductor. There's a type for every contact combination—including the Chance AGP with heavy fortified cadmium coating for additional protection on bimetal connections.

ABC INDUSTRIES

A. B. CHANCE COMPANY General Offices CENTRALIA, MISSOURI

CC59-4A

New ORANGEBURG® CA* CONDUIT *with Flush Coupling Attached!*

With no separate couplings to handle or attach on the job, Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2° male taper at the other end, making installation a simple, one-step operation. And, since the coupling *is* attached, there are no coupling cartons to warehouse or carry to the job.

What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time.

Like the hundreds of millions of feet of Orangeburg fibre conduit in use since 1893, new CA has self-sealing joints and impermeable walls. Its smooth, 100% fibre raceway adds years to cable life.

New Orangeburg CA is available in 2", 3", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. **ES-49** for Catalog 52.

ORANGEBURG MANUFACTURING CO.
Orangeburg, New York • Newark, California
A Division of The Flintkote Company, Manufacturers of America's Broadest Line of Building Products

Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.

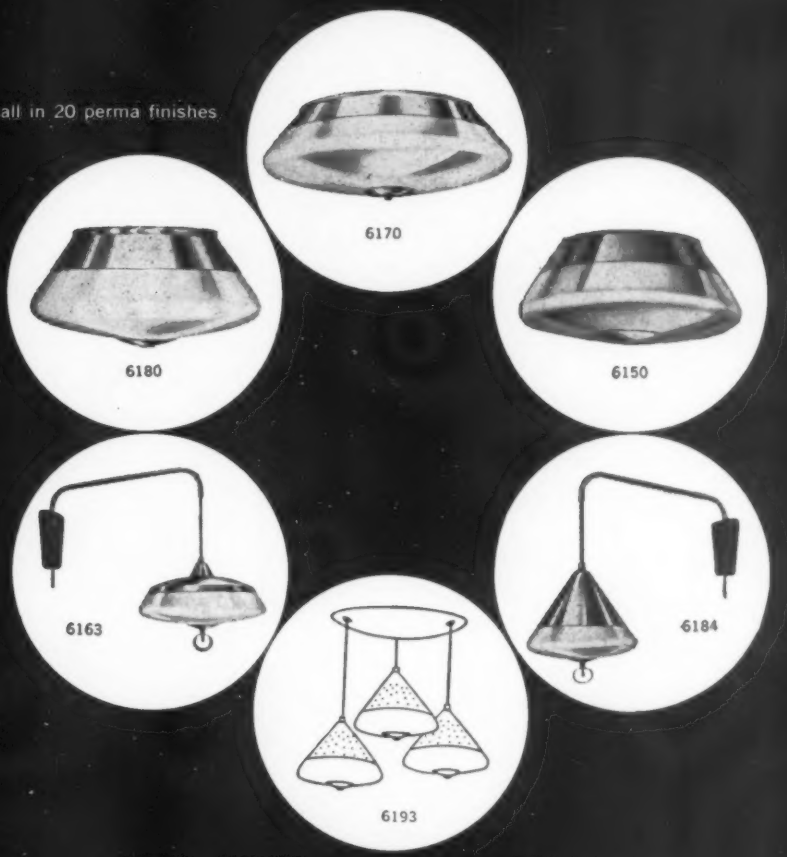
beautiful streamlined design *universal function*

our new

INTERCONTINENTAL SERIES

Thirty-one superb fixtures – all born of the same basic design – created by the great award-winning EJS designer – and produced by the finest talent of the two continents. From Europe's most gifted artisans – the flawless, satin-textured, handblown triplex glass. From America's finest craftsmen – guided by our brilliant EJS engineer – the hand-spinnings, precision-made, precision-perforated and finished. Result: a complete series of decorative, functional fixtures – transitional in styling, crossing all lines of period – fulfilling every type of lighting need. Here are six representative applications. Literature showing all 31 applications available on request.

all in 20 perma finishes



6170 Semi-flush Ceiling Fixture. 17" diameter. 5" depth. 4 lights – 60w ea.

6180 Semi-flush Ceiling Fixture. 10½" diameter. 5" depth. 2 lights – 60w ea.

6150 Semi-flush Ceiling Fixture. 13" diameter. 5" depth. 4 lights – 60w ea.

6193 Drop Cord Fixture. 12" Canopy. 10½" diameter. 6 lights – 60w ea.

6184 Wall Pull-Down. Adjustable pulley; solid walnut mounting. 10½" diameter. 2 lights – 60w ea.

6163 Wall Pull-down. Adjustable pulley; solid walnut mounting. 13" diameter. 3 lights – 60w ea.

EJS

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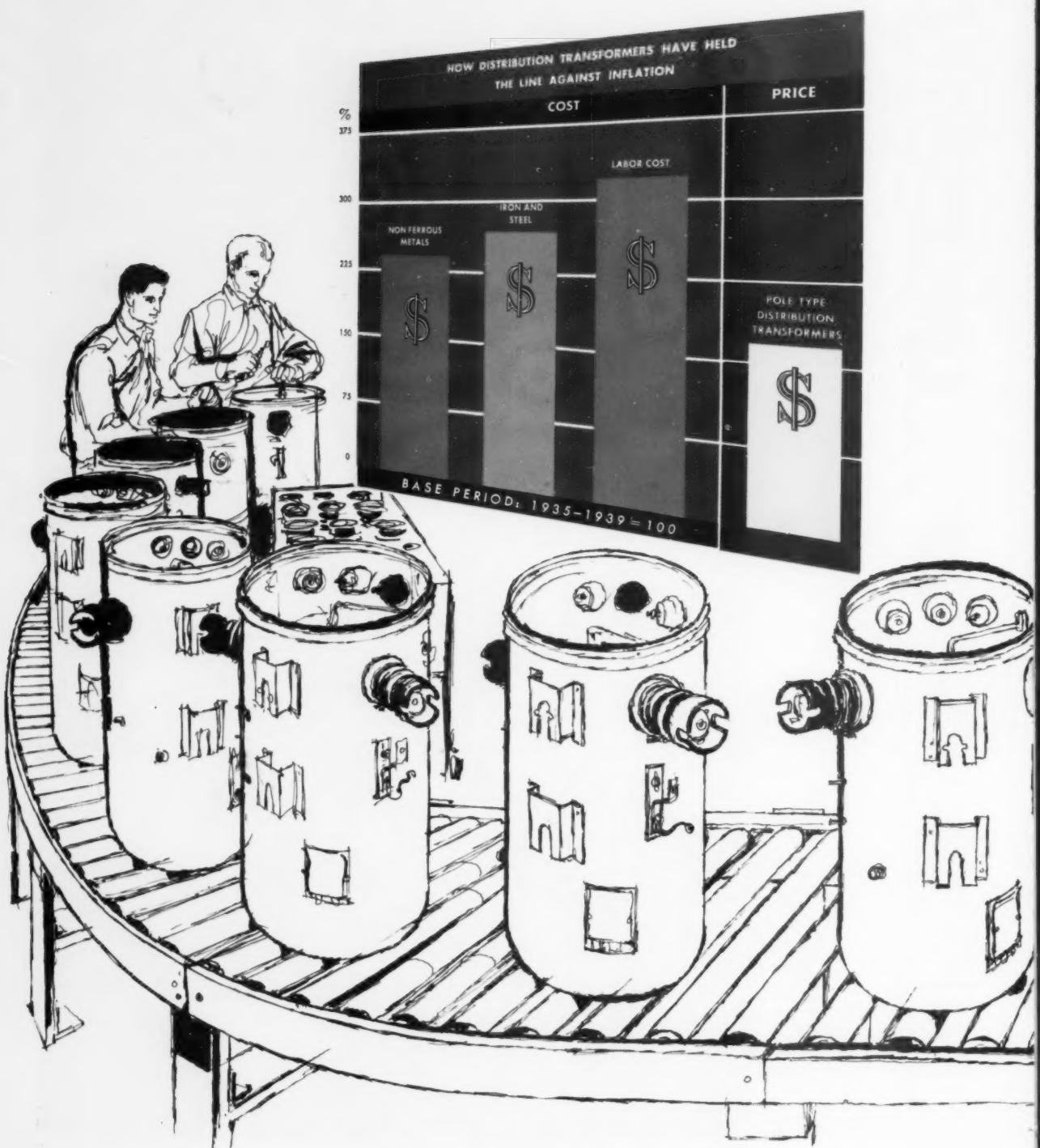
Before you buy another



transformer... ANALYZE PRICE

General Electric keeps price down with standardization, volume, product innovation

Using the period from 1935 to 1939 as the base, nonferrous metals are up 135%, iron and steel up 174%, and labor is up 234%. Yet G-E pole-type distribution transformers are now up only 66%.

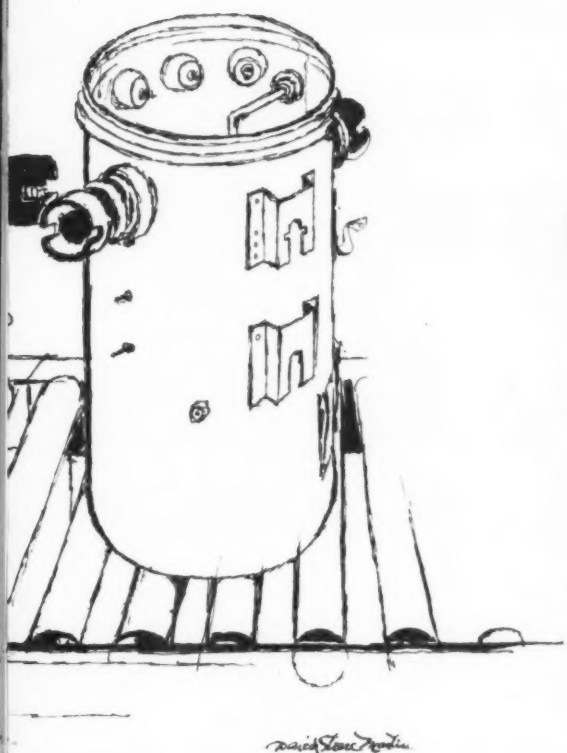
The cost of transformers remains comparatively low thanks in part to your increasing number of large-volume orders and to your support of standardization programs. Both contribute importantly to economical mass production.

Product innovations have also helped keep transformer prices down. General Electric's $1,000,000 development of grain-oriented strip steel, for example, has resulted in an estimated saving of over $300,000,000 to utilities since the steel was introduced twenty years ago.

Before you buy another distribution transformer, analyze price—give your transformer manufacturer credit for the extra values he gives you. General Electric Company, Schenectady 5, New York. 431-82

Progress Is Our Most Important Product

GENERAL ELECTRIC



GIVE YOUR TRANSFORMER MANUFACTURER CREDIT FOR THE EXTRA VALUES HE GIVES YOU

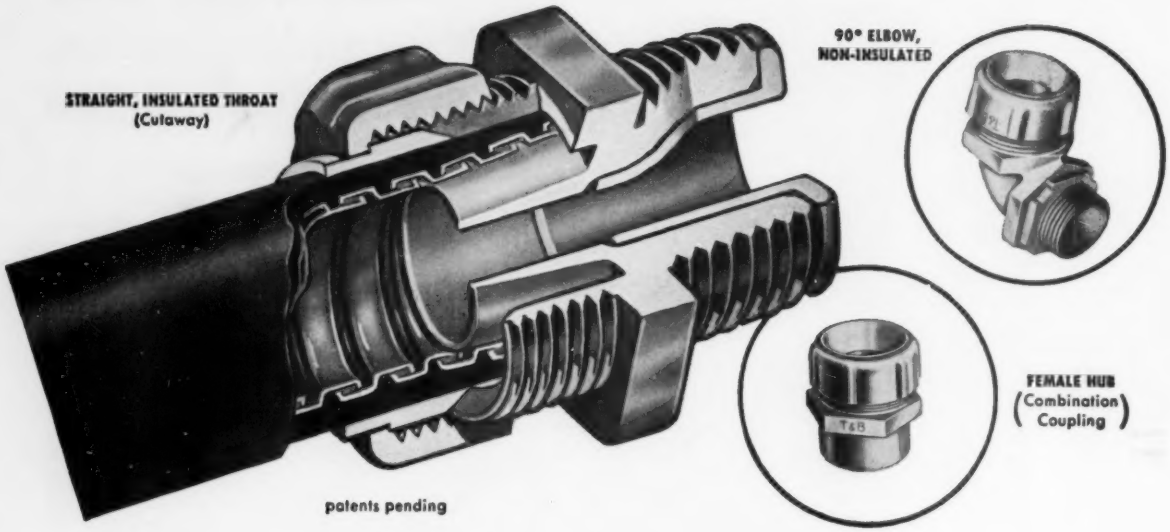
		G.E.	OTHER MFRS.			
MEASURE LOAD BUILDING—do Co.'s other products build load? Does Co. sponsor load-building programs?						
CHECK SERVICE—24-hour shipment? repair and uprating? emergency assistance?						
COMPARE FEATURES—how many exclusive features in terms of longer life; reliability; easy maintenance?						
ANALYZE PRICE—does Co. hold line against inflation with significant product developments?						
EVALUATE INNOVATIONS—has Co.'s research paid off for you? Recent examples?						

FILL IN THE BLANKS . . . See which manufacturer gives you more for your transformer dollar: Mark "X" for a measurable contribution, "O" for insignificant contribution.

ONLY T&B CONNECTORS

*for flexible liquid-tight conduit**

OFFER ALL THESE ADVANTAGES



patents pending

THE T&B LINE provides a size range of ⅜" to 4" in the straight, 45° and 90° angle types . . . both insulated and non-insulated.

THE T&B LINE includes combination couplings from ⅜" to 1¼".

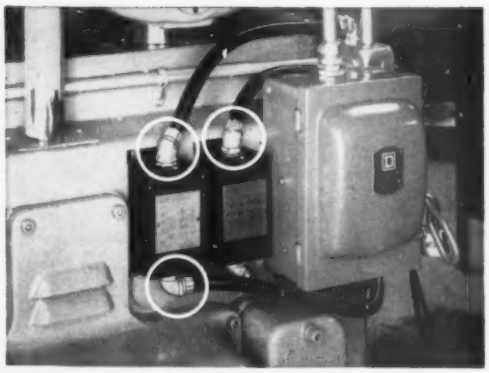
A T&B Liquid-Tight connection can't be half safe. The mechanical strength, continuity of ground, and oil seal are all interdependent. Each gives positive assurance that you have all three. And T&B's more compact design means easier installation and improved appearance.

Your T&B distributor has this complete line in stock. Be sure to ask for a demonstration . . . or write direct to T&B for detailed specifications.

* *Sealtite or equivalent*

THE T&B INSULATED LINE complies with all codes:

The National Electric Code (Paragraph 3736b)
J.I.C. Standards (Paragraphs 22.1.7 and 22.2.2)
Machine Tool Electrical Standards (Paragraph 22.1.7)



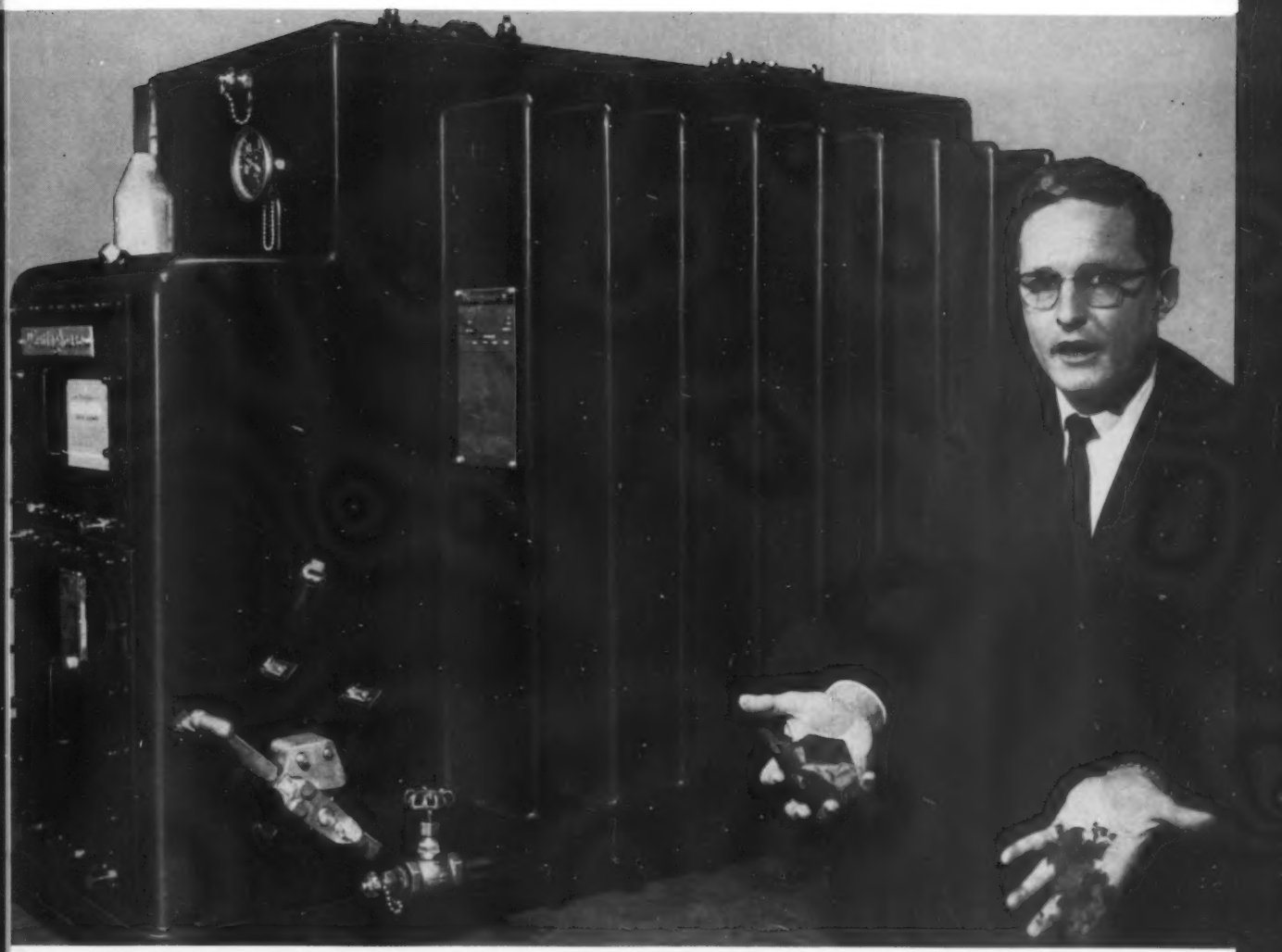
LOOK FOR THIS SIGN — AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED **T&B** DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

THE THOMAS & BETTS CO.

INCORPORATED
72 BUTLER STREET, ELIZABETH 1, NEW JERSEY
THOMAS & BETTS, LTD., MONTREAL, P. Q., CANADA
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



The "Crumble Test" proves superior heat resistance of Westinghouse Insuldur-system insulation . . . J. C. Gardner, Westinghouse network transformer representative at the Sharon, Pa., plant, demonstrates how overload and summer heat can "kill" insulation in transformers without the Insuldur system . . . while Insuldur system "stays alive."

Higher ambients, same overloads...but no heat damage

WITH WESTINGHOUSE SPACE-MISER NETWORK TRANSFORMERS

Now . . . Insuldur system guards insulation life in Westinghouse Space-Miser network transformers

Heat is the major threat to transformer insulation life —whether from emergency overload conditions or high summer ambients.

The new Insuldur* insulation system now available in Westinghouse oil-immersed Space-Miser network transformers reduces the heat threat from both sources.

Now, higher emergency overloads can be carried without fear of shortening insulation life . . . because Westinghouse network transformers with the Insuldur system operate *safely* at temperatures up to ten degrees higher than previous safe temperature limits.

Summer heat wave problems are reduced, because load-carrying ability is assured for ambients up to ten degrees higher with the Insuldur system.

The Insuldur insulation system is a Westinghouse exclusive—no other network transformer has this positive insulation-life protection.

Westinghouse oil-immersed network transformers with the Insuldur insulation system retain dollar-saving flexibility . . . easy future change to Inerteen® should the need arise.

Ask your Westinghouse representative about the Insuldur insulation system . . . a "Bonus Value" from Westinghouse Plowback of Earnings into research.

*Trade-Mark

J-70898

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Transmission substation grounding

By I. B. Clevenger
Design engineer
Substation design section
Union Electric Co.
St. Louis, Mo.

◆ GROUNDING SYSTEMS are quite often designed using past designs as a guide; which is good practice so long as past designs have been yielding good results. Also, there is probably a tendency for most designers to over-design a grounding system rather than under-design. This again would seem to be good practice for several reasons:

(1) There are many unknowns which can influence results.

(2) Personnel safety is involved.

(3) Cross-sectional area of buried conductors tends to decrease through the years due to corrosion.

(4) Cost of the grounding installation is usually 1% or less of the total cost of a major transmission substation, and economies which can be realized by paring certain items would not seem to be great enough to offset the risk of under-designing too far and having to go through the costly process of going back in and "beefing" up the grounding system after it is installed.

There are presently four transmission substations in service on the Union Electric System in the St. Louis Metropolitan area. Another is under construction, and several more are in the planning stage. These stations are each 138-34.5 kv, with two (or three) 100 mva, 3 phase transformers and three 34.5 kv feeder bus sections.

Bus tie oil circuit breakers are operated normally closed and the maximum fault level of the 34.5 kv buses is in the neighborhood of 1,000 mva for 3 phase faults, and 500 mva for single phase to ground faults. The phase to ground fault level is held down by the use of reactors in the neutrals of 34.5 kv transformer windings.

Design practice for designing grounding systems for these substations consists generally of following past practice. The grounding systems take the form of driven copperweld rods, 5/8" x 15', interconnected with properly sized bare, stranded, soft-drawn copper cable buried in a trench approximately 2 feet beneath the ground surface.

All sub-surface connections between cable and rods, and main cable and cable taps to equipment, are made by the "Cadweld" process. All above surface connections to equipment and steel are made with bolted clamp type terminals.

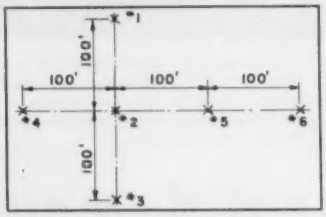
Bare, soft-drawn copper cable risers are brought up to lightning arresters, steel, major equipment, and switch operating rods. Connections from ground to transformer lightning arresters are made by means of a cable riser to the transformer tank grounding pad, with a copper bar continuing up the tank wall to the arresters. Transformer specifications are written to make the transformer manufacturer responsible for furnishing the copper bar and mounting materials

Line arresters, if possible, are grounded by a "through" cable or ground bus, with a riser connection to each end of the bus for each

GROUND RESISTANCE

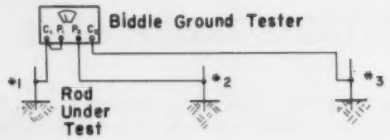
TEST PROCEDURE
FOR
PRELIMINARY ESTIMATE

TEST ROD LOCATION:



① All rods 15' × 5/8" copperweld.
② Spacing should be approx. as shown but need not be exact.
③ Drive all rods 2' to start.
④ Rod *6 is a reference rod only. Should be driven only 2' & removed after test.

INSTRUMENT & CONNECTIONS:



DATA TO BE TABULATED:

Ohms

Rod No.		1	2	3	4	5
Depth	2'					
	4'					
	6'					
	8'					
	10					
	12'					
	15'					
Inst. Conn-ections	C_1-P_1	Rod 1	2	3	4	5
	P_2	" 2	5	2	2	2
	C_2	" 3	6	1	5	4

CONDITION OF SOIL:

Fig. 1—Test procedure and data form for making advance estimates of substation ground resistance characteristics.

set of three arresters. Major equipment such as transformers, oil circuit breakers, etc., have at least two riser connections where possible. Ground risers to disconnect switch operating rods are connected through flexible copper braid to a point just above the handle.

At recent installations a practice has been initiated to provide a mat of 1/0 stranded copper wire laid just beneath the rock surface, with one end connected to the riser going to the switch operating rod, and the other end connected to the main sub-surface ground grid. The purpose of the mat is to equalize potential between the operator's feet and hands.

Fence protection

Chain link fences are tied to the main ground at intervals and a #4 solid wire is woven into the fence fabric near the bottom for the entire length of the fence. Flexible braids are carried across the hinge points of gates.

A buried ground wire is laid around the station approximately one foot outside the fence with driven rods spaced at 20 to 30 feet intervals. The wire is buried at the same depth as the main station grid and is connected to both the station grid and the fence at several points.

The primary purpose of this conductor is to reduce dangerous voltages which might appear between fence and ground due to ground potential gradients. Secondary benefits of lower over-all station ground resistance, and increased safety in case a phase wire is dropped on the fence, are also gained.

Placement of ground rods is by no means done in a scientific manner. In most cases their actual location is dependent more or less on the station layout and location of major equipment. In general the runs for the underground main grid are laid out to encircle main structures and equipment, and cross ties are made between main runs so that the over-all grid takes the form of a network made up of

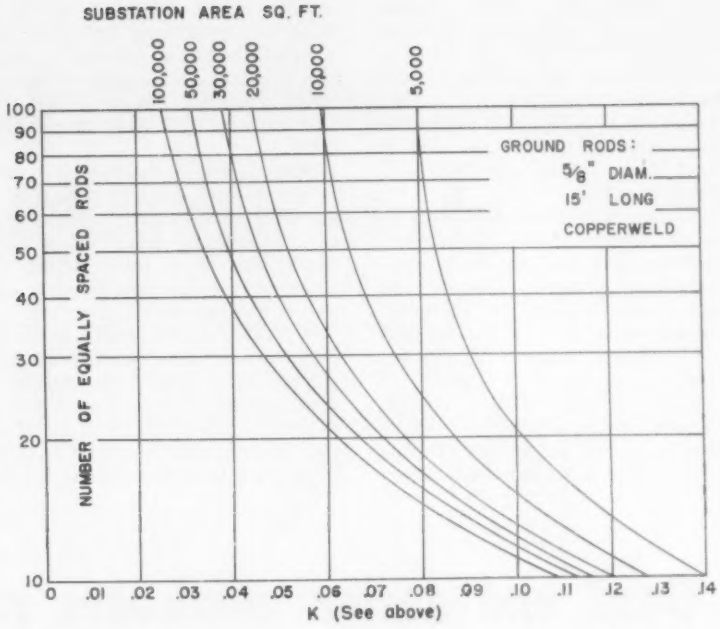


Fig. 2—How substation ground resistance is affected by the number of ground rods used. (Resistance of all rods in parallel to ground is equal to K X resistance of one isolated rod to ground.)

ESTIMATES AND FINAL MEASUREMENTS OF GROUND RESISTANCE AT TWO UNION ELECTRIC SUBSTATIONS

PRELIMINARY TESTS:

Rod No.	Berkeley Sub. Ohms 1	2	3	4	5	Ridge Sub. Ohms 1	2	3	4	5
Depth, ft. 2	25	40	55	48	45	13	67	94	53	237
4	20	14.2	13	15	15	9.2	14.7	24.2	16.8	6.6
6	10	9.5	8.2	10.2	10	6.3	7.4	17.6	14.3	4.8
8	7	7.5	7.0	7.5	7.5	5.9	5.2	16.7	10.4	3.8
10	5.5	6.5	6.5	6.0	5.8	4.3	3.7	15.4	8.9	3.3
12	5.0	5.5	5.5	5.0	5.2	4.3	3.4	12.9	7.9	3.2
15	4.5	5.0	5.2	4.5	4.2	5.6	3.4	12.4	5.7	2.9

ESTIMATE OF GROUNDING SYSTEM RESISTANCE

	BERKELEY	RIDGE
Average resistance, one rod at 15' (ohms)	4.7	6.0
Estimated total substation area (sq. ft.)	128,000	60,000
Estimated No. of rods to be installed.	116	65
Estimated resistance to ground of grounding system, from curve (ohms)	0.10	0.21

ACTUAL MEASURED RESISTANCE OF GROUNDING SYSTEM

From field measurements(Average of several readings)	0.11	0.20

Fig. 3—Comparison of estimates and final measurements of ground resistance at two transmission substations of Union Electric Co.

approximately 20 to 30 ft. squares. Ground rods are located at even intervals along these runs so as to provide evenly spaced rods on approximately 30 to 40 ft. centers. The layout is influenced somewhat by locating the runs so that a trenching machine can be used where possible.

This general method of grounding has been used for a number of years and has resulted in satisfactorily low ground resistance at most stations. Costs do not seem prohibitive so this same method will probably be used in the future.

There seemed to be a need, however, for predicting the resistance to ground before the grounding system is installed. This information could be used to detect poor soil conditions or other factors which might adversely affect the end result. Special measures could then be designed into the system initially rather than added later.

Also, there is sometimes a need in the design stage of a station to estimate the potential rise on the station ground grid during fault conditions. This information, for instance, can be used to size telephone insulating transformers.

With this need in mind, a simplified method was devised of predicting final ground resistance of a grounding system such as is normally installed on the Union Electric System. This method may be briefly outlined as follows:

(1) Take field measurements at the substation site to determine the average resistance to ground of an isolated ground rod. The instrument used for these measurements is a Biddle ground tester and the tests are made by the company's relay test department, with assistance from the substations department maintenance crews. As a matter of interest, the resistance is read at different depths as the rod is driven, with the value at final depth being the one used for the estimate. The test procedure used is outlined in Fig. 1.

(2) Make a preliminary design layout to determine ground rod placement, and from this note the

(Continued on page 130)

Dead end design eliminates radio-TV troubles

By C. K. Jones
Overhead Planning Engineer
City Public Service Board
San Antonio, Texas

◆ RADIO AND TELEVISION trouble caused by loose hardware in slack spans has been eliminated by the use of preformed dead ends on pin type insulators instead of conventional strain insulator dead end assemblies or hook type dead ends.

Also, excess strain in slack spans, caused by the strain insulator dead end assemblies has been eliminated, thereby reducing the tendency of the tap off pole to lean and put more slack in the span.

Figure 1 shows the preformed dead end assembly - fastened to one insulator which supports the strain of the slack span. The other insulator is used to support the jumper wire.

Figure 2 shows a double arm arrangement where both arms are on one side of the pole. In this case only one insulator is used to support the preformed dead end assembly and to support the jumper wire.

The method shown by Figure 2 is preferred because of ease in installation and replacement. This type will also support greater dead end strains and precludes the use of wing guys. Arms and hardware are assembled by the manufacturer and are ready for installation. Conductors up to and including 556,500 cir. mils all-aluminum have been used with this type of construction. Usually, the tap off pole is set somewhat deeper than standard to further reduce tendency of pole to lean.

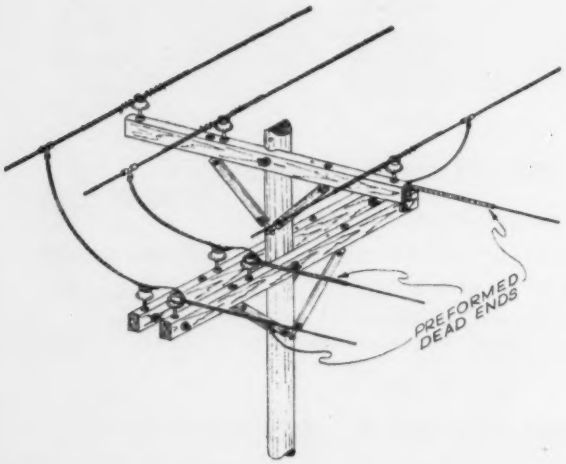


Figure 1—Standards drawing showing preformed end assembly fastened to one insulator which supports the strain of the slack span.

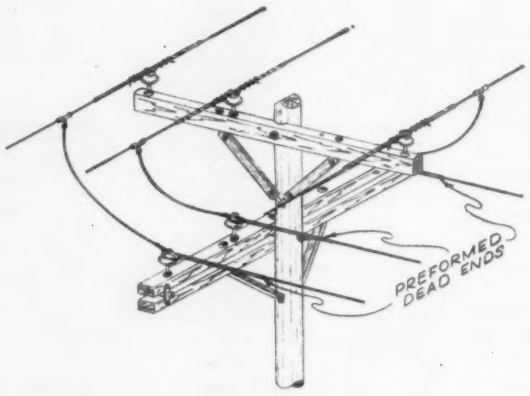


Figure 2—Double arm arrangement where both cross arms are located on far side of pole. One insulator supports preformed dead end assembly and jumper.

Distribution system protective equipment application study

By Ted L. Hatcher
Texas Power & Light Co.
Dallas, Texas

This is the second of two articles adapted from a comprehensive discussion presented by the author at the recent Power Distribution Conference sponsored by the University of Texas' Electrical Engineering Department.

◆ SEPARATELY MOUNTED primary fuses are normally used to protect the conventional type distribution transformers. On the Texas Power and Light Company system a transformer fusing standard is followed normally for ease of application. This standard as shown in Figure 4 is easy to remember and assures installation of the proper size fuse. The standard calls for the fuse size to be twice the transformer rated full load current for grounded wye systems. Similarly, the fuse size is twice the full load current through the fuse on delta systems. Our standard is based on the use of the NEMA standard 200% rated fuse with the Type K speed.

Fuse ratings are based on several standards. At one time, fuses were rated by the minimum current necessary to blow the fuse. In 1943, the NEMA standard called for an N rated fuse which would blow at a minimum of approximately 150% of the rated current value. Shortly after the 1943 NEMA standard was made for the N rated fuse, a new E standard rating was made for power fuses which had a minimum melting current of approximately 200% of the rated value. The latest EEI-NEMA standard H, T and K speed fuses provide for a minimum melting current of approximately 200% of the rated value. The Type H fuses are called high surge links and are made in the ratings of 1 to 5 amperes. The Type K and T fuses are nominally called fast and slow speed respectively, getting their names from their time-current characteristics. Figure 5 shows typical time current characteristics of some of the various standard type fuses.

Most fuse time-current characteristics are based on no preload on the fuse and an ambient temperature of 25° C. Where close coordination is involved preloading adjustment factors can be considered. Also, corrections can be made for

TRANSFORMER FUSING TABLE

Transformer Voltage	2400		4160		7200		12500		Transformer Voltage
Transformer Size KVA	Full Load Amps.	Fuse Size Amps.	Full Load Amps.	Fuse Size Amps.	Full Load Amps.	Fuse Size Amps	Full Load Amps.	Fuse Size Amps.	Transformer Size KVA
1	.4	5	.2	5	.1	5	x	x	1
1.5	.6	5	.4	5	.2	5	x	x	1.5
3	1.3	5	.7	5	.4	5	.2	5	3
5	2.1	5	1.2	5	.7	5	.4	5	5
7.5	3.1	7	1.8	5	1.0	5	.6	5	7.5
10	4.2	10	2.4	5	1.4	5	.8	5	10
15	6.3	15	3.6	7	2.1	5	1.2	5	15
25	10.4	20	6.0	10	3.5	7	2.0	5	25
37.5	15.6	30	9.0	15	5.2	10	3.0	5	37.5
50	20.8	40	12.1	20	7.0	15	4.0	7	50
75	31.3	65	18.0	30	10.4	20	6.0	10	75
100	41.7	80	24.0	40	14.0	30	8.0	15	100
150-167	62.5	125	36.0	50	20.8	40	12.0	20	150-167
200	83.3	150	48.1	80	27.8	50	16.0	25	200
250	104.0	200	60.0	100	34.7	65	20.0	30	250
333	139.0	-	80.0	150	46.2	100	26.6	50	333
500	208.0	-	120.0	-	69.4	150	40.0	80	500

For various transformer connections fuse as follows:

(1) SINGLE PHASE TRANSFORMERS:- Fuse for size transformer as in table.
(2) THREE PHASE OPEN WYE CONNECTED TRANSFORMERS:- Fuse each transformer as in table.
(3) THREE PHASE WYE CONNECTED TRANSFORMERS:- Fuse each transformer as in table.
(4) THREE PHASE OPEN DELTA CONNECTED TRANSFORMERS EQUAL SIZE:- Fuse each phase to transformers as in table for size transformer used.
(5) THREE PHASE CLOSED DELTA CONNECTED TRANSFORMERS EQUAL SIZE:- Fuse each phase to transformers with fuse nearest TWICE that in table for size transformer used.
(6) THREE PHASE OPEN DELTA CONNECTED TRANSFORMERS ONE LARGE AND ONE SMALL:- Fuse the two phases to the larger transformer as in the table for large transformer. Fuse the one phase to the smaller transformer as in table for smaller transformer.
(7) THREE PHASE CLOSED DELTA CONNECTED TRANSFORMERS ONE LARGE AND TWO SMALL:- Fuse the two phases to the larger transformer as in table for large transformer. Fuse the one phase to the smaller transformers with fuse nearest TWICE that in table for small transformer. The fuses for the larger transformer should, however, be not smaller than the fuse for the smaller transformers.
(8) THREE PHASE CLOSED DELTA CONNECTED TRANSFORMERS ONE LARGE, ONE MEDIUM AND ONE SMALL:- Fuse the two phases to the large transformer as in table for large transformer. Fuse the one phase to the medium and small transformers with fuse nearest TWICE that in table for size of medium transformer. The fuses for the large transformer should, however, be not smaller than the fuse for the smaller transformers.

See Distribution Standard Drawing TA-25107 for Standard Transformer Connections. Consult Engineering Department on all other transformer connections, for transformers larger than 500 kva, and for special cases.
Standard fuse links are rated to carry 100% of rated current continuously and to blow at 230% of rated current in five minutes.

Fig. 4—This transformer fusing standard is a part of the Distribution Standards of the Texas Power and Light Co. It greatly simplifies the application of fuses and assures installation of proper size.

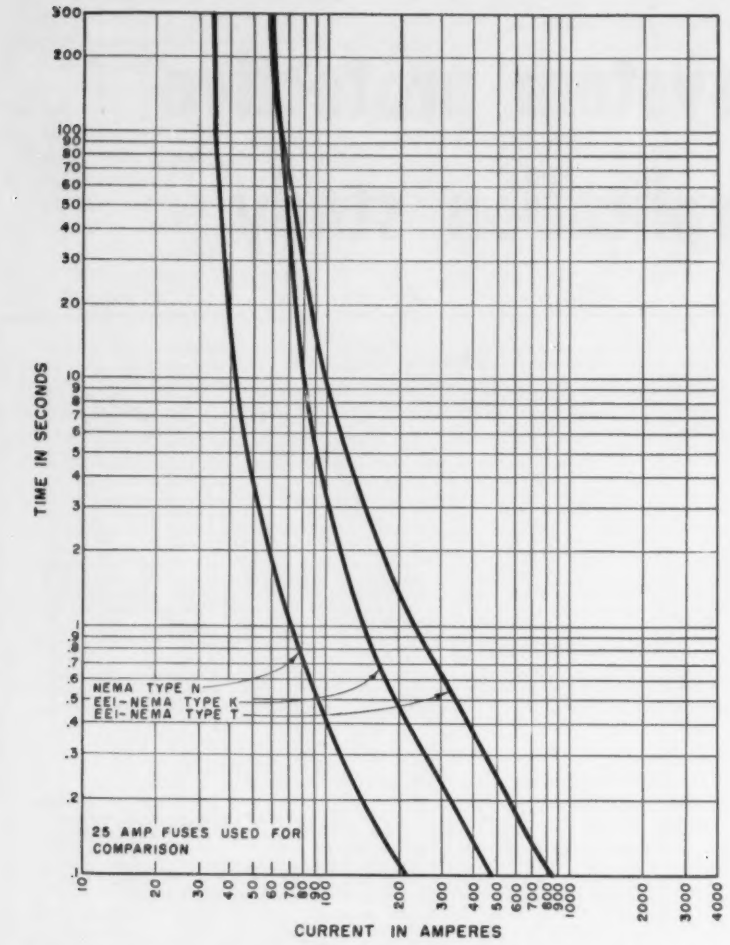


Fig. 5—These are typical time-current characteristics for some of the various standard type fuses.

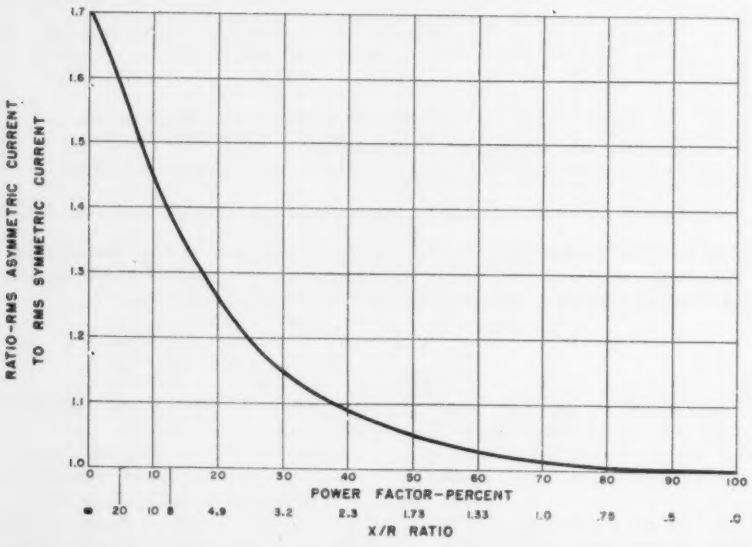


Fig. 6—This curve shows the maximum possible ratio of asymetrical to symetrical fault current based on varying X/R ratios.

varying ambient temperatures. In most cases, this is not necessary and will possibly lead to trouble, since the accurate calculations may mislead the engineer to the point that other inaccuracies, such as the tolerance in manufacturing, may be overlooked. In studying cases of trouble and searching for possible causes, the preloading and ambient temperature correction factors may warrant consideration.

In arriving at a transformer fusing standard, one must consider the maximum expected continuous load current, excessive short time load inrush currents, available short circuit currents, and primary and secondary coordinating devices. Recent operating records of Texas Power & Light Company indicate little trouble has been experienced with transformer fuses blowing due to continuous load current or short time inrush current. Also, this standard has in most cases fitted into the over-all distribution coordination scheme.

The cases where trouble has been experienced with this transformer fusing standard are on 7200 volt, 250 kva and above transformers and on 2400 volt, 150 kva and above transformers. Most transformer banks utilizing these size transformers are studied individually where coordination appears to be a problem or where adequate transformer protection is questionable.

Figure 6 shows the maximum possible ratio of asymetrical to symetrical fault current based on varying X/R ratios. Our standard fuse cutouts have an interrupting rating of 5000 asymetrical rms amperes. Based on an average X/R ratio of approximately 5 to 1, the symetrical rms interrupting rating of these fused cutouts is 4,000 amperes. The 12.5 kv substation line-to-ground short circuit current is normally limited to 4,000 symetrical rms amperes or less by the use of neutral reactors. In some instances an effectively grounded system could not be maintained if the phase-to-ground short circuit had been limited to 4,000 amperes. Where this has occurred, the fused cutouts near the substation have been replaced with cutouts having a higher interrupting capacity.

Where completely self-protected and rural type transformers are used, the internal primary weak link and either the secondary circuit breaker or external secondary fuse are depended on for system and transformer protection. The

primary weak link is to protect the system in case of an internal transformer fault, and the secondary circuit breaker or fuse is to protect the transformer from overload.

Shunt capacitor protection

Figure 7 shows the company's shunt capacitor fusing standard. The standard calls for a fuse rating of approximately twice the normal load current of the capacitor bank.

The large inrush current that can be obtained when switching capacitors is difficult to accurately predict. Inrush current calculations can be made, but are not made as a general rule due to the long and tedious process that would be required. The above mentioned capacitor fusing standard has been used with very satisfactory operating experience.

Primary line protection

As previously mentioned, there are in general use two concepts of primary distribution line protection. One method is fast ground relay tripping, instantaneous reclosing, and then time delay ground tripping of the substation breaker. The second method is to omit the fast ground relay and have only time delay ground tripping. Texas Power & Light Company uses the second method omitting the fast ground relay. Some of the reasons for the selection of this method of relaying over the fast ground relaying scheme are as follows:

1. Fewer momentary customer outages are experienced.

2. Less complicated substation circuit breaker tripping and reclosing circuits are involved, resulting in a saving in cost of switchboard wiring and relaying equipment as well as a saving in application, testing and maintenance. Since operations of the OCB are appreciably reduced, maintenance on the oil circuit breaker is less.

3. Most of the company's substations serve small towns along with the surrounding rural communities. Oil circuit reclosers, are used near the city limits of these towns to reduce exposure on the urban portion of the feeder and to protect for faults on the long rural extensions. Thus there is only a small area in which the fast ground relaying scheme might be desired.

4. Where oil circuit reclosers are used in the coordination scheme with substation breakers, the tripping of the substation breaker for faults immediately beyond the reclosers are considered undesirable, and it is difficult to provide the desirable coordination in practice.

5. Many faults are self-clearing and will often cause unnecessary momentary feeder interruptions when the fast ground relaying scheme is used.

6. Our record of fuse replacements indicates only a small possible saving through the use of the fast ground relaying scheme of substations even in the urban areas such as Waco.

Figure 8 shows the protective devices normally provided on what is considered the typical 4.16 kv or 12.5 kv grounded wye distribution feeder of Texas Power & Light Company. All single phase laterals tapping main three phase circuits are fused. Rural three phase and open wye extensions are protected by three phase or two fuses on the single phase laterals. Oftentimes it is necessary to use two or more oil circuit reclosers in series to provide adequate load carrying capacity and protection. Single phase reclosers are applied on long single phase rural extensions to reduce outage time followingtemporary faults. The standard operating sequence of these oil circuit reclosers used on distribution primaries is two instantaneous and two retarded operations.

Although several oil circuit reclosers have been applied on dis-

SIZES OF FUSES & CUTOUTS FOR VARIOUS CAPACITOR BANKS

Capacitor Bank Size	Normal Current	Fuse Size	Normal Cutout Rating	Arrester Rating When Used
			For 12.5/7.2 kv 3ϕ Wye Lines	
1200 kva	55.6	100 amp	7.5 kv - 100 amp	9 kv
900 kva	41.6	80 amp	7.5 kv - 100 amp	9 kv
600 kva	27.8	50 amp	7.5 kv - 50 amp	9 kv
300 kva	13.9	25 amp	7.5 kv - 50 amp	9 kv
225 kva	10.4	20 amp	7.5 kv - 50 amp	9 kv
180 kva	8.3	15 amp	7.5 kv - 50 amp	9 kv
135 kva	6.2	15 amp	7.5 kv - 50 amp	9 kv
90 kva	4.2	10 amp	7.5 kv - 50 amp	None
45 kva	2.1	5 amp	7.5 kv - 50 amp	None
			For 12.5/7.2 kv 3ϕ Open-Wye Lines	
200 kva	13.9	25 amp	7.5 kv - 50 amp	9 kv
150 kva	10.4	20 amp	7.5 kv - 50 amp	9 kv
120 kva	8.3	15 amp	7.5 kv - 50 amp	None
60 kva	4.2	10 amp	7.5 kv - 50 amp	None
30 kva	2.1	5 amp	7.5 kv - 50 amp	None
			For 7.2 kv 3ϕ Delta Lines	
300 kva	24.0	50 amp	7.5 kv - 50 amp	9 kv
225 kva	18.0	40 amp	7.5 kv - 50 amp	9 kv
180 kva	14.5	30 amp	7.5 kv - 50 amp	9 kv
135 kva	10.8	20 amp	7.5 kv - 50 amp	9 kv
90 kva	7.2	15 amp	7.5 kv - 50 amp	None
45 kva	3.6	7 amp	7.5 kv - 50 amp	None
			For 7.2 kv Single Phase Lines	
75 kva	10.4	20 amp	7.5 kv - 50 amp	None
50 kva	6.9	15 amp	7.5 kv - 50 amp	None
30 kva	4.2	10 amp	7.5 kv - 50 amp	None
15 kva	2.1	5 amp	7.5 kv - 50 amp	None
			For 4.16/2.4 kv 3ϕ Wye Lines	
180 kva	25.0	50 amp	5 kv - 50 amp	3 kv
135 kva	18.7	40 amp	5 kv - 50 amp	3 kv
90 kva	12.5	30 amp	5 kv - 50 amp	None
45 kva	6.3	15 amp	5 kv - 50 amp	None
			For 2400 Volt 3ϕ Delta Lines	
180 kva	43.4	65 amp	5 kv - 100 amp	3 kv
135 kva	32.5	65 amp	5 kv - 100 amp	3 kv
90 kva	21.6	40 amp	5 kv - 50 amp	None
45 kva	10.8	20 amp	5 kv - 50 amp	None
			For 2.4 kv Single Phase Lines	
30 kva	12.5	30 amp	5 kv - 50 amp	None
15 kva	6.2	15 amp	5 kv - 50 amp	None

Neutral point must be connected to common neutral conductor on wye and on open-wye connected banks.

Fig. 7—Distribution standards showing proper fusing for capacitors.

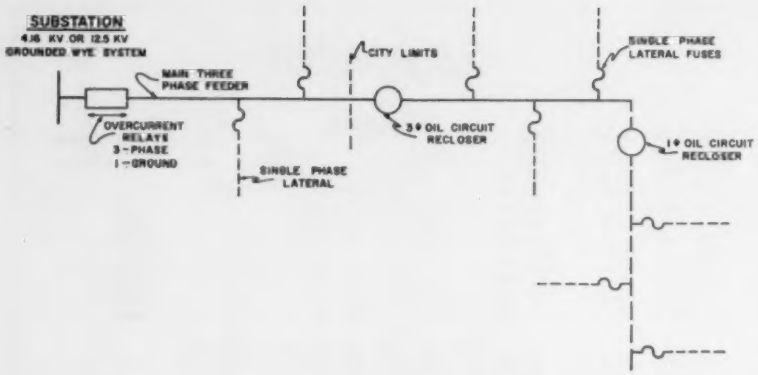


Fig. 8—This diagram shows the protective devices normally provided on what is considered the typical 4.16 kv or 12.5 kv grounded wye distribution feeder on the system of the Texas Power and Light Co.

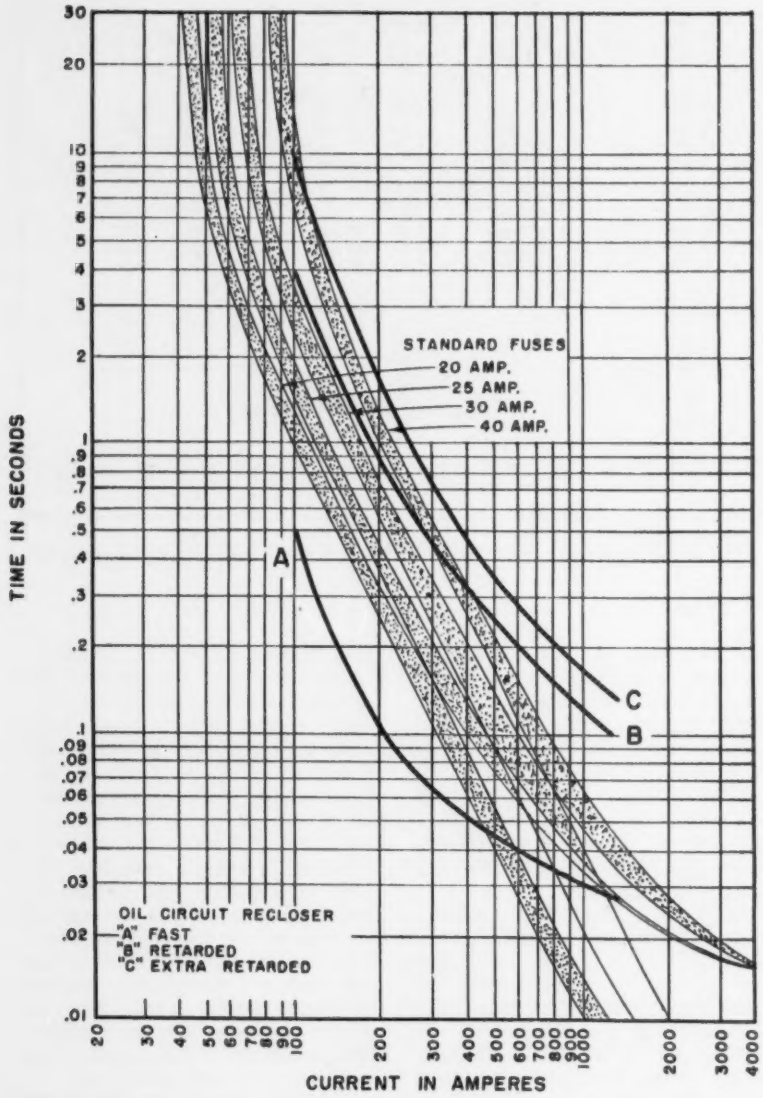


Fig. 9—Typical coordination curve of a restorer and a lateral fuse.

tribution feeders at 4000 kva, 69-12.5 kv substations and smaller to reduce costs, the use of oil circuit breakers at substations remains the predominant practice because most additions are made in larger substations. Where oil circuit reclosers have been applied at substations, the load served has been mainly rural areas.

Single-phase laterals

In the application of fuses on single phase to neutral laterals served by restorers or circuit breakers having one or more fast and slow operations, the fuse should be selected so as to coordinate with both the fast and slow operations. The fuse must not be damaged during the fast operations of the backup device but should clear before the time delay tripping occurs. Figure 9 shows a typical coordination curve of a restorer and lateral fuse. The time-current characteristic of the fast operations limits the minimum size fuse that can be used, and the time-current characteristic of the slow operation limits the largest size fuse that can be used. The fact that heat can be stored in a fuse should not be overlooked when fast reclosing of the recloser or circuit breaker is employed.

The fuse must be sufficiently small to protect for a fault at the end of the protected lateral, and must be adequate to protect the conductor from burndown for faults near the fuse. The time-current characteristic of the fuse should be selected so that coordination is maintained with other fuses on transformers and capacitor banks served from the lateral. It is very desirable to select only one size fuse for all laterals on the section of the feeder protected by a service restorer or circuit breaker for ease of application. However, this is not always practical when there are wide ranges of fault currents and large size transformer or capacitor fuses are involved.

The application of fuses on single phase to neutral laterals served by a substation breaker without the fast tripping ground relay is somewhat easier than with it. The minimum size lateral fuse is no longer required to coordinate with the fast operation of the substation breaker. However, a new requirement is that the fuse should not be damaged during the operation of lightning arresters or other transient surges. We have found that the allowance of at least 2 or

3 cycles on damaging time of the fuse at the maximum fault current will usually provide satisfactory fuse operation.

On delta systems, only those single phase laterals that cannot be protected by an oil circuit breaker or restorer are fused on the Texas Power & Light Company system. This practice is followed because two fuses are required to completely isolate the faulted section. Oftentimes only one fuse will blow due to a slight difference in time-current characteristics leaving the section energized by one phase which may create a hazard.

On extremely long single phase-to-neutral rural extensions where more than one sectionalizing point is desirable, the company uses one or more single phase oil circuit reclosers along with fuses on the tapped sections. In order to prevent the fuses on the tapped sections from blowing for temporary faults, these restorers must detect faults at the ends of the tapped sections. Although there is no reason why series fuses in a single phase lateral cannot be coordinated, this practice has not been found necessary by the company.

Open wye feeder sections

Three phase and two phase oil circuit restorers are applied on the company's distribution system to provide overcurrent protection for three phase and open wye sections of the feeder. A restorer is selected which will operate for the minimum fault current on the protected section, protect the line section from burndown, coordinate with other restorers nearer the substation or the substation breaker, pickup the cold load of the feeder, and has adequate continuous current and interrupting current ratings.

Unless load pickup devices are used, available restorers will have an adequate continuous current rating if they will pickup the 2.5 to 4.0 times normal cold load current of an average feeder. We have found that when the peak load on the restorer approaches 65 to 80% of the continuous current rating of the restorer, or approximately 33 to 40% of the minimum tripping current, trouble can be expected in picking up the cold load of the feeder.

The symmetrical rms fault current at the desirable location of a restorer will often be slightly higher than the symmetrical rms rated interrupting current of the standard duty distribution class restorer, indicating the requirement of a more costly restorer. Where the X/R ratio of the system is less than the X/R ratio used in the ratings of the restorer, some advantage can be gained if the full asymmetrical interrupting current rating of the restorer and asymmetrical fault current are used.

Main three-phase feeders

At 69-12.5 kv substations which are expected to remain at 4,000 kva and below for several years, Texas Power & Light Company has been installing the lower cost reclosers instead of oil circuit breakers. The newer power class oil circuit restorers with short circuit interrupting capacities above 100 mva will no doubt be applied in the future in substations above 4,000 kva. We have been hesitant to do this in the past due to the less flexible phase-to-ground primary operated protective device that is available for these restorers. This less desirable feature can be overcome by remote operation of the restorer through the use of overcurrent and reclosing relays as normally used on oil circuit breakers.

When remote operation is used on a restorer or oil circuit breaker, the coordinating and protective requirements are transferred to the relays. Thus, the only requirements of the oil circuit breaker or restorer are the continuous load carrying capacity, short circuit interrupting capacity and momentary short-time current capacity. The remote operating devices must then be selected to provide the coordinating and protective features.

The lower cost overcurrent relays are generally used for the protection of radial distribution circuits. These relays are available with several time-current characteristics. The selection of any one of the various time-current characteristics will depend on other protective equipment installed on the feeder. The more inverse characteristic with a slow resetting feature is usually selected where only fuses are involved on the feeder, since this characteristic more nearly corresponds to the characteristic of a fuse. Where restorers are involved, the fast reset that can be obtained with definite time relays may be the determining factor. In any case, the selected relay and associated breaker or restorer must coordinate with both the transmission and distribution protective equipment, and provide substation transformer overload protection.

All of the basic requirements of a restorer applied on the distribution system to protect a three phase section of feeder apply to the substation feeder protective equipment in addition to those mentioned above.

Humidity conditions produce power failure

◆ TWO-THIRDS of downtown San Antonio was without electric power recently for about five hours after moisture condensed in the 13 kv bus and switch structure of the indoor distribution substation adjacent to the Mission Road Plant.

The unprecedented condition resulted from practically 100% humid air coming in contact with exceptionally cold concrete and steel structures caused by the cold weather experienced several days prior to the outage. The moisture reduced the insulation of the equipment to the extent that it was necessary to dismantle the structure and dry all equipment before service could be restored.

This distribution station consists of four busses, any two of which can serve the downtown underground network system and heretofore it was considered as being able to guarantee uninterrupted service at all times. However, the extreme moisture condition saturated the insulation of all four busses and made it impossible to keep any of them in operation.

To prevent a recurrence of the trouble, large heating and air drying equipment is being installed.

Cover photo shows hot line school

APPROXIMATELY 50 utility company delegates from nine Latin American countries completed a two-part Live Line Training Program recently at the San Francisco Electric Plant in Panama. It was sponsored by Cia. Panamena de Fuerza y Luz in cooperation with the A. B. Chance Co., Centralia, Mo. Represented were seven companies affiliated with the American & Foreign Power System and eight other utility organizations. Demonstrator for the groups was A. G. Anderson of A. B. Chance Co.

Many of the representatives had never used "hot line" tools, but after a few classes most of them were ready to use the tools.

Parallel operation of regulators

By Dwight Kortman
Regulator Dept.
Allis-Chalmers Mfg. Co.

This is the fifth of a series of articles on the subject of voltage regulators. This article deals with the general requirements for paralleling regulators. A continuation of this discussion next month will present several specific schemes for parallel operation.

◆ PARALLEL OPERATION of three-phase regulators has become an increasingly important application because of the rapid increase in load growth throughout the country. Regulators and their respective transformers may be paralleled for a variety of reasons such as:

1. Load growth may exceed a present substation capacity of one or more regulator-transformer lineups. Another regulator-transformer lineup might be added and paralleled to the existing unit or units to adequately supply present and future loads.

2. Continuity and reliability of service can be increased. One unit could be removed from service while the remaining unit or units continue to supply power to the substation bus.

3. Two systems might be tied together at two points to form a loop for more efficient operation.

When operating two or more transformers in parallel, the following requirements should be met:

Transformers should have—

1. The same voltage rating or at least be capable of being safely rerated to operate at the required voltage.

2. The same per cent impedance on their respective kva ratings.

3. Approximately the same ratio of resistance to reactance.

4. The same no load ratio of transformation.

5. They must have the same phase sequence.

As soon as regulators are added to the picture, certain problems and difficulties relating to paralleled operation increase. This is due chiefly to a misunderstanding as to the problem involved when two or more regulators are paralleled, and also the proper solution to this problem. It should be stated at this point that whenever a reference is made to paralleling regulators, a standard, two-winding transformer is used in series with a three-phase regulator.

In paralleling regulators, the listed requirements for paralleling transformers should be met. In ad-

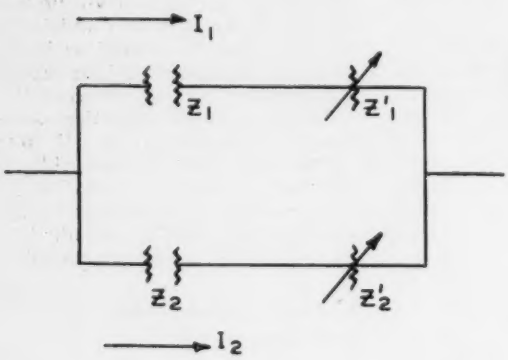


Figure 1

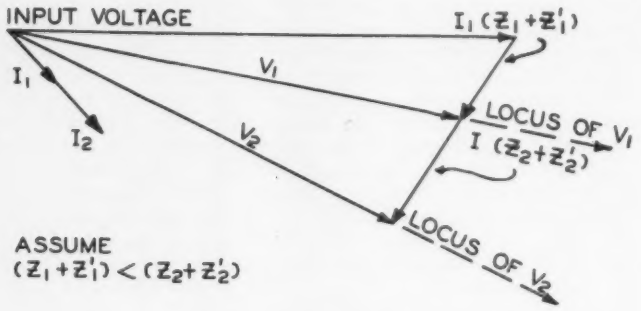


Figure 2

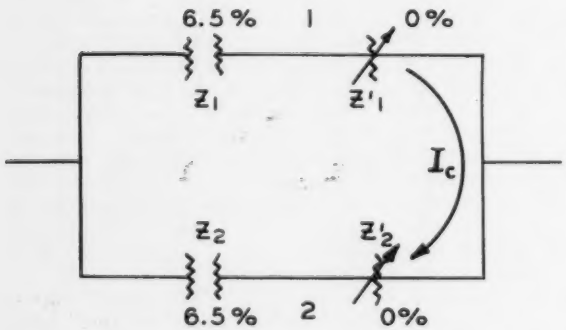


Figure 3

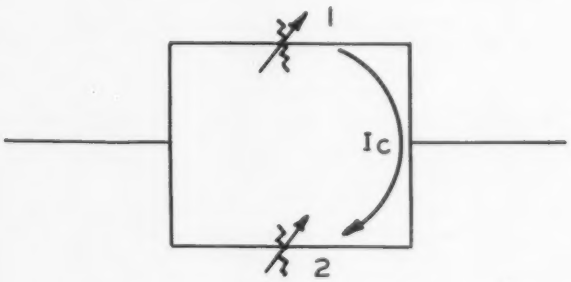
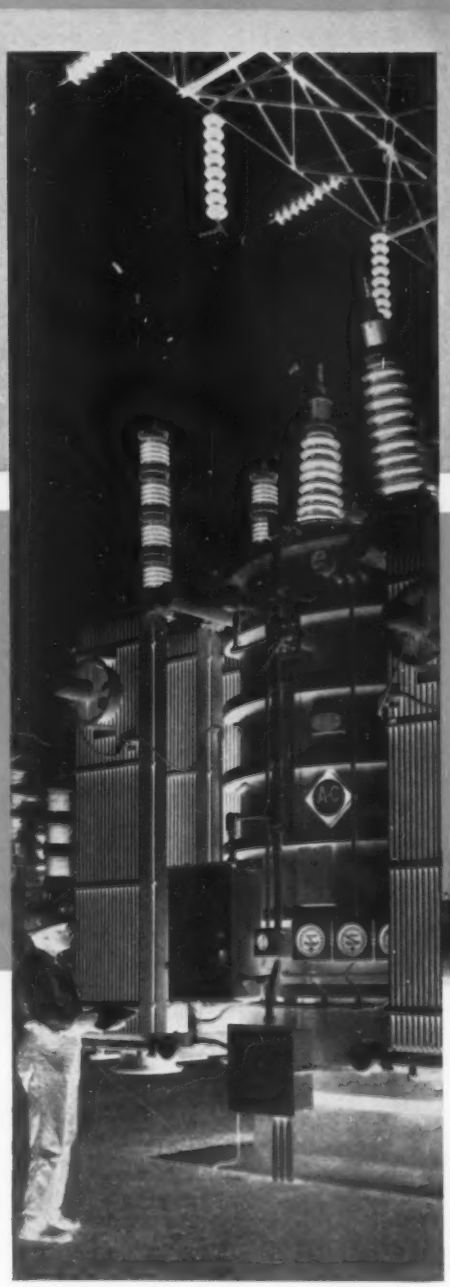


Figure 4

ALLIS-CHALMERS modern line for '59



Extras...Extras...

Read all about them

It's the extras that make the difference in the electrical equipment field today! There's much standardization today, but there's still room for the designer's genius. There's still room for features resulting from research or field experience.

While you're buying — update! And to update — look for the extras. They make the difference.

Some of the extras Allis-Chalmers offers are shown on the following pages. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5908-E

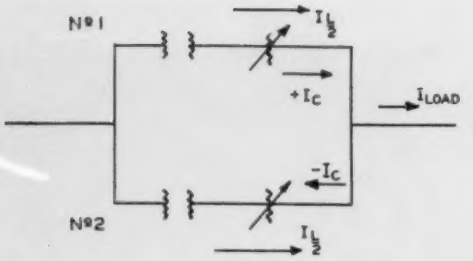


Figure 5

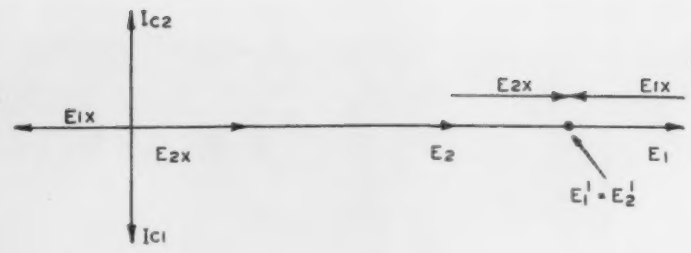


Figure 6

dition, the regulators should also be similar units as far as voltage rating and impedances, and they should preferably have the same load carrying capacity as their respective transformers.

A transformer and a regulator, (Figure 1) whose impedances are represented by Z_1 and Z_1' respectively, are connected in parallel with a second regulator and transformer (impedances, Z_2 and Z_2'). Obviously the voltages of the two circuits that are paralleled must be the same. Likewise the impedances of the two circuits should also be the same. Therefore, the equation for the voltage drop around the loop will be:

$(Z_1 + Z_1')\ I_1 + (Z_2 + Z_2')\ I_2 = 0$

If the impedances of the two transformers and the two regulators are equal, then $Z_1 + Z_1' = Z_2 + Z_2'$. This being the case, $I_1 = I_2$, and the currents will divide equally in both halves of the loop. If the impedance of transformer 2 had been 50 per cent greater than that of transformer 1, then the current being carried by unit 1 would have been 50 per cent greater than that through unit 2.

In a case where both regulators have the same kva rating, unit 1 would be overloaded. Normally, when units are paralleled, their impedances are practically equal, and they will divide the load according to their kva rating. If the regulator kva ratings are the same, the load would be divided equally.

Occasionally an unsuccessful attempt is made to parallel two circuits of unequal impedances, with the mistaken belief that equal currents can be made to flow between the two circuits and the unequal impedance drops balanced by added or subtracted voltage through manipulation of the regulators. As seen in Figure 2, the input voltage is the same for each of the two circuits. V_1 and V_2 are the output voltages of the two regulators, when they are carrying equal currents.

It is evident that any standard regulator can only vary the magnitude of its output voltage. The locus of the output voltage of regulator 1 as it is varied must lie on the vector V_1, and the locus of the output voltage of regulator 2 must lie along the vector V_2. Regardless of how much these voltages are varied, they will never be equal except when they are both equal to zero.

Regulators can vary the magnitude of their output voltages, but the division of load (kw) will be in accordance with the impedance in each circuit. In most cases, this impedance is primarily the transformer impedance, so that the loads will divide according to the transformer impedances.

Again referring to Figure 1, assuming all things equal and that the ideal condition for paralleling is met, there are still *two* separate regulators in a closed loop circuit. In all probability they will not always be on the same tap position at the same time. In a closed loop circuit one point will be at a higher potential than another.

This condition immediately sets up a circulating current which flows within the loop from the point of higher potential to the point of lower potential, assuming for purposes of calculating circulating currents that a regulator has zero impedance. Actually, a regulator may have as much as ½ per cent impedance. However, this would be true only when the unit is at the maximum raise or lower position. Since the regulator could be on neutral as well as any other position, it is necessary to assume that it has zero impedance. This would allow a slight safety factor in calculating circulating currents.

In other words, circulating current calculations would be based on the minimum loop impedance, giving the maximum circulating current that would flow.

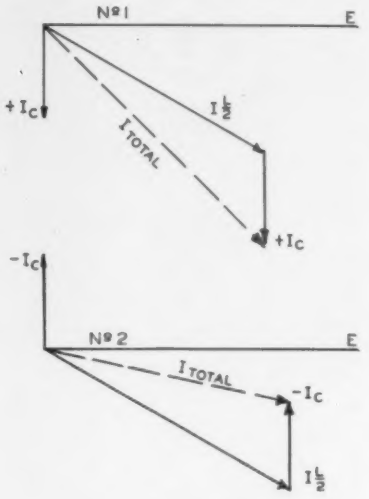


Figure 7

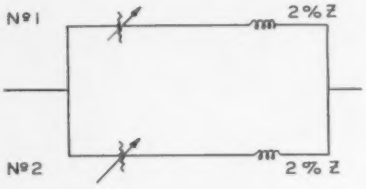


Figure 8

For an example of calculating circulating current, refer to Figure 3. Assume that the transformers in circuit 1 and 2 both have equal impedances of 6.5 per cent, and that there is zero per cent impedance in the two regulators. Also assume that the regulator in circuit 1 is on one step raise, and the regulator in circuit 2 is at neutral. The voltage differential between the two regulators would be ⅝ per cent. Total impedance in the loop is 13.0 per cent and the voltage differential is ⅝ per cent (.625 per cent). The per cent circulating current is the voltage differental divided by the total loop impedance:

Per cent $I_c = (.625 \times 100)/13 = 4.8\%$

ALLIS-CHALMERS modern line for '59

New twist in regulation!

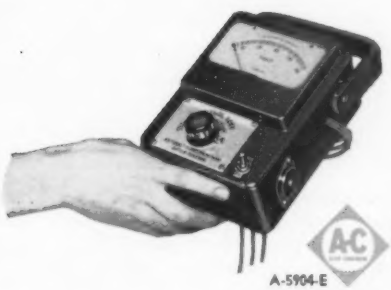
Caliband control provides accurate settings quickly . . . eliminates customer complaints

Now you can set or test voltage level and band width without changing customer voltage or interrupting regulated service. A twist of the *Caliband* control knob does it.

Caliband control demonstrator

Ask an A-C engineer to demonstrate *Caliband* control at your desk with an actual unit in a portable kit. Contact your nearby A-C office for a demonstration, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

Caliband is an Allis-Chalmers trademark.



A-5904-E

ALLIS-CHALMERS

Originators of 5/8% step regulators

Circulating current would be 4.8 per cent if the two regulators are only one step apart. If the regulators are two steps apart, the circulating current would be twice as great. If the units were three steps apart, the circulating current would be 14.4 per cent, etc. As a general rule, it is recommended that the circulating current be limited to a value that does not exceed 15 per cent.

In this example, the regulators could operate as much as three steps apart and not exceed this maximum circulating current. The higher the impedance in the loop, the smaller the circulating current. Conversely, the lower the impedance, the higher the circulating current.

Unsuccessful attempts have been made to parallel two regulators without transformers in the circuit at all. Figure 4 shows two regulators paralleled by connecting the source sides together and also the load sides together. *This is a very unsatisfactory and dangerous*

(Continued on page 131)

Mobile vans put in operation to demonstrate aluminum conduit

◆ TWO MOBILE VANS for bringing door-to-door demonstrations on handling aluminum conduit to electrical contractors, distributors, utilities, plant electrical groups, and special meetings have just been placed in operation by Kaiser Aluminum & Chemical Sales, Inc.

The demonstration trucks are equipped with all tools and supplies necessary for cutting, bending, and threading aluminum rigid conduit in standard sizes ranging from ½-inch through 6-inches. Inside displays feature conduit fittings and accessories manufactured by well-known firms such as Thomas & Betts, Burndy, Crouse Hinds, Adalet, Appleton, Toledo Pipe, and Killark. Additional displays include aluminum building wire terminals and connectors, and samples of Kaiser Aluminum electrical products.

"The vehicles are being operated by specialists who are qualified to give complete instructions on the best installation procedures for aluminum rigid conduit," states Gillette N. Houck, manager of promotion and technical development of the company's Electrical Conductor Division. "There is a large potential market for aluminum conduit but it is vitally necessary at this point to make available practical information about the product before that potential can be realized."

Kaiser Aluminum just recently entered the conduit business with a U. L. listed line of standard diameter sizes in 10-foot lengths, along with aluminum conduit couplings and 90 degree elbows. Mr. Houck points out that the current market for steel conduit exceeds 800 million pounds annually. "Today's prices for aluminum conduit are directly competitive with steel, and because it is one-third the weight of steel, aluminum conduit has a lower installed cost in the majority of instances.

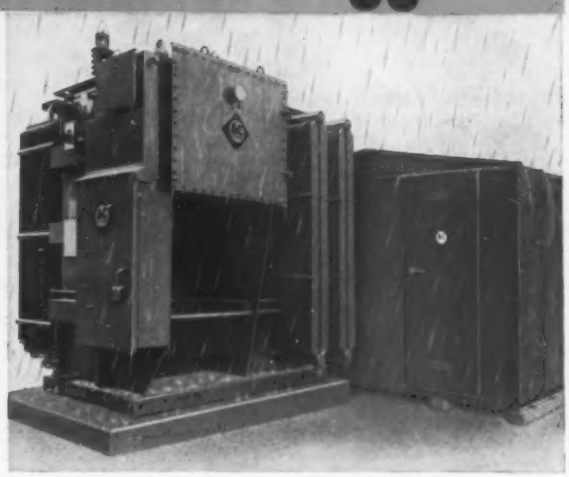
"For these reasons," Mr. Houck continues, "we expect aluminum to command as much as 75 per cent of the conduit market by 1965. This depends, of course, upon the success of aluminum conduit manufacturers in promoting the product, and more importantly, in getting information on its advantages and proper handling to the electrical industry. Our conduit vans were conceived for that purpose, and we plan to equip others later on so that demonstrations can be given in all parts of the country. The first two are serving in an area covering a dozen eastern and midwestern states."

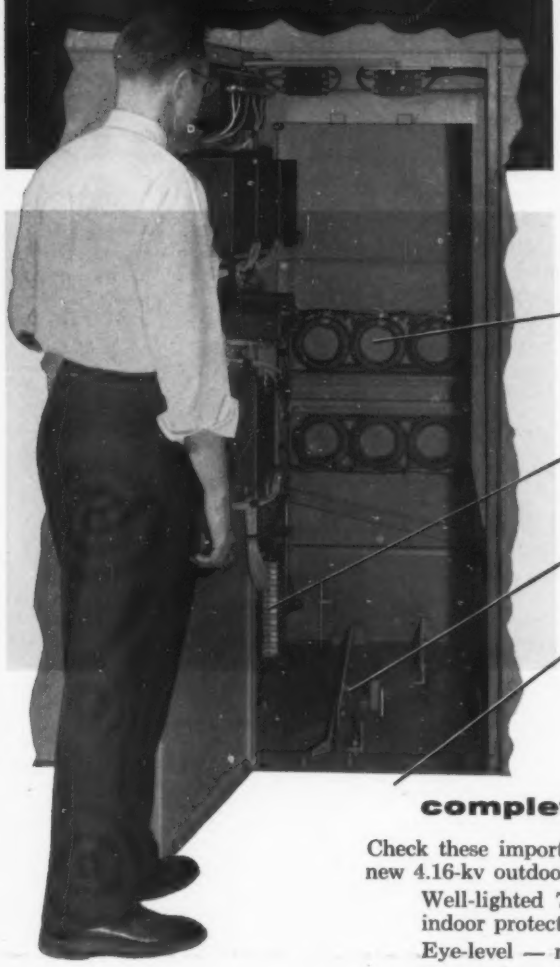
Past objections to the use of aluminum rigid conduit are no longer valid, according to Mr. Houck. "Just a few years ago, aluminum conduit was as much as 75 per cent more expensive than steel. Now, particularly in sizes exceeding 1¼-inches, the installed cost of aluminum is less, and often substantially so.

"With Kaiser Aluminum offering a complete line, the availabilities picture has also improved considerably," Mr. Houck states. "And nearly all of the objections we used to hear about the difficulties involved in threading and bending aluminum simply have no basis in fact. We believe our conduit demonstration program will perform a real service to the electrical industry by spreading practical information about a product which has so many advantages."

Displays on interior wall of new Kaiser Aluminum conduit demonstration vans show examples of aluminum conduit, wire and cable, and accessory items. A work bench extends along opposite wall, equipped with tools for cutting, threading, and bending aluminum conduit.

ALLIS-CHALMERS modern line for '59





- Aisleway accessibility — current transformers in front of positive-acting shutters.
- Automatic connecting, self-aligning secondary disconnects — no plug jumpers.
- Interlock-guide track self-aligns breaker.
- Flush mounting with floor eases breaker insertion.

NEW Shelter-Clad . . .

completely accessible switchgear

Check these important "accessibility" features of Allis-Chalmers new 4.16-kv outdoor switchgear:

Well-lighted 75-inch-wide service aisle for clean, roomy, indoor protection.

Eye-level — no stretch — instrumentation.

Room above breaker to house potential transformers or control power transformer fuses.

Relay, rectifier, and capacitor elements are mounted on breaker for easy access when breaker is in aisleway.

Standard secondary terminal blocks are accessible from inside aisleway.

In addition to these "accessibility" features, you get *Pyro-Shield* track-resistant insulation plus unique personnel safety features.

Get all the details from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pyro-Shield and *Shelter-Clad* are Allis-Chalmers trademarks.

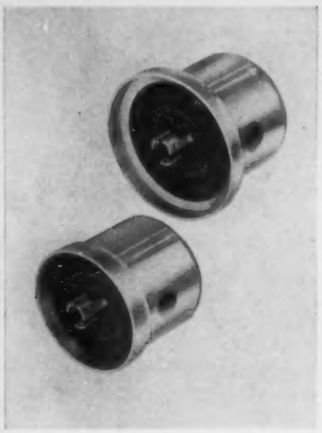
A-5918-E

ALLIS-CHALMERS

Notes on new utility equipment

Photoelectric control unit resists "arc-over" damage

BY ISOLATING the three-prong plug terminals with a phenolic base design, the SunSwitch 5940 tubeless photoelectric control unit for street lighting applications provides resist-



ance to "arc-over" damage from induced voltage surges. Manufactured by the Ripley Co., Inc., Middletown, Conn., the control will fit mercury or filament design hoods and is designed to conform to EEI-NEMA specifications.

The cadmium sulphide cell is hermetically-sealed against moisture. Unit has built-in lightning arrestor—guarding against damage from voltage surges. Control is so designed that lamps will remain on in event of component failure. Housing is weather-proof plastic globe, and the cork composition gasket eliminates vibration and seals out moisture, dirt, and insects.

Write U-401 on reply card, page 19.

Anti-contaminant grease developed for insulators

THE DEVELOPMENT of a new silicone grease for insulator contamination problems has been announced by P. R. Hartig, general manager, of the Insulator Department General Electric Co., Baltimore, Md. This new anti-contaminant grease is available in two convenient forms—Insulgrease, a paste, and Insuljel, a convenient liquid for spray application.

Insuljel, when sprayed on insulator surfaces, provides an excellent coating for the engulfment of industrial and natural contaminants which, when moistened by dew or light rain, lowers electrical withstand characteristics. It quickly sheds water droplets, Mr. Hartig stated, and it encapsulates contamination particles in a moisture proof seal, eliminating the occurrence of low resistance paths for the flow of leakage current.

Insuljel contains the silicone grease —Insulgrease—dispersed in a fast evaporating solvent. This solvent has been carefully selected for rapid drying, non-inflammability, and hot line application.

Among the labor and money saving advantages of Insuljel are the benefits of hot line application and the convenience of first application without the necessity of removing light to moderate coatings of the contaminants. In addition, Insuljel can be reapplied without removing previous contaminant saturated coatings.

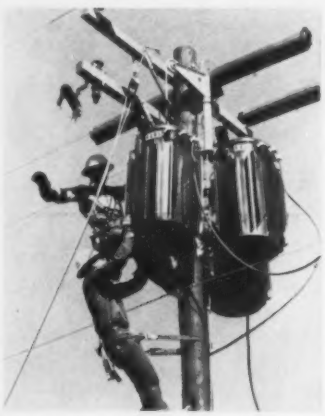
Write U-402 on reply card, page 19.

Manual hoist features redesigned base clamp

AN IMPROVED VERSION of the MoPeCo transformer hoist has been announced by the manufacturer, Morrison-Pelsue Co., 2256 S. Delaware St., Denver, Colo.

This manual hoist, operating from a truck winch, has a redesigned base clamp with increased strength and support which greatly increases the safety factor for workmen high on utility poles. The two-piece unit is lifted from a line and assembled at the top of the pole. The base clamps are secured to the pole by means of sturdy pole chains and a simple, fast-operating clamp.

The swivel head, which seats into the tubular base assembly, has been



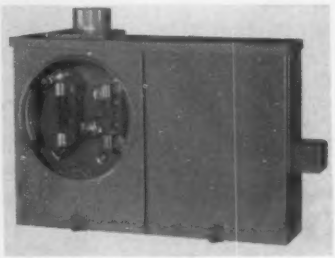
shortened to permit faster and easier assembly on the pole. The cable from the truck winch passes up through the base assembly, over the sheaves. The rear sheave has been dropped two inches to prevent slippage or bind hazard. Sheaves have been designed to accommodate either steel cable or manila line.

The 42-pound unit is inexpensive, versatile, and portable. It eliminates the need, in many cases, for large hydraulic mobile installation equipment. Two workmen on the line can install three transformers in only 30 minutes with the truck operator working the winch line—a significant saving in time and installation costs.

Write U-403 on reply card, page 19.

Unit combines meter socket with secondary capacitor

A NEW ADDITION to the Secovar line of service entrance type secondary power factor correction capacitors has been announced by Sangamo Electric Co., Springfield,



Ill. Designated Type OS (original socket), the unit consists of a meter socket with either one or two 1 kvar capacitors preassembled in a standard duplex housing. This combination unit is ideal for new construction or for re-wiring installations.

Installed cost per kilovar for secondary capacitors is extremely low because the only installation cost involved is for the meter socket which would always be required. The Type OS, like other Secovar models, is fused and can be furnished with a Klixon thermostat switch if desired.

Write U-404 on reply card, page 19

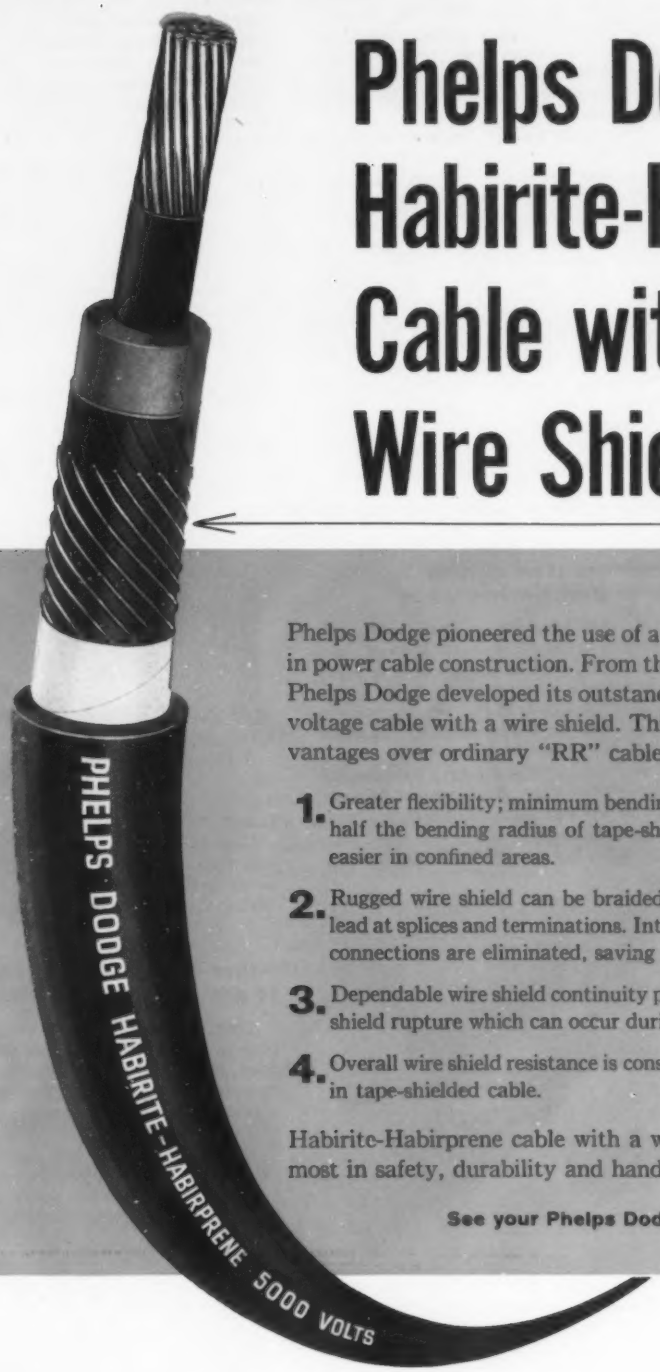
Pole type distribution transformers improved

SUBSTANTIAL reduction in size resulted from redesigning pole type distribution transformers by Wagner Electric Corp., 6440 Plymouth Ave., St. Louis 14, Mo. The 25-kva Type HEK transformer, for example, is only 37 inches high.

The annealed steel core provides low reluctance path for magnetic lines of force, resulting in lower exciting current. Heavy wet process porcelain high voltage bushings are

For contractors who want the finest . . .

Phelps Dodge Habirite-Habirprene Cable with Wire Shield!



Phelps Dodge pioneered the use of a wire shield as a standard item in power cable construction. From this background and experience, Phelps Dodge developed its outstanding Habirite-Habirprene high voltage cable with a wire shield. This cable offers a number of advantages over ordinary "RR" cable with tape shield including:

1. Greater flexibility; minimum bending radius in most cases is less than half the bending radius of tape-shielded cable, making installation easier in confined areas.
2. Rugged wire shield can be braided or bunched for use as a ground lead at splices and terminations. Intermediate steps in making ground connections are eliminated, saving time and effort.
3. Dependable wire shield continuity provides protection against hidden shield rupture which can occur during installation or in service.
4. Overall wire shield resistance is constant without the variations found in tape-shielded cable.

Habirite-Habirprene cable with a wire shield assures you the utmost in safety, durability and handling ease.

See your Phelps Dodge Distributor!

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 PARK AVENUE, NEW YORK 22, N. Y.

PD

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N.C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N.Y., San Francisco, St. Louis, Seattle, Washington, D.C.

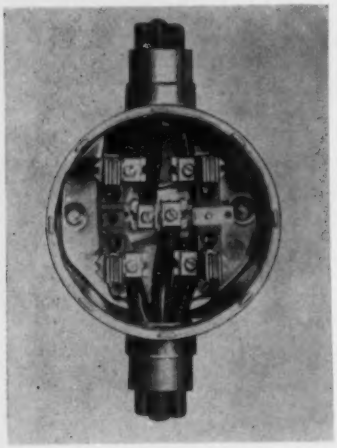
safety-keyed. All terminals are key-locked in the bushing porcelain; sidewall bushings are key-locked in the tank wall.

Anti-corrosive paint is hot sprayed on tanks below 50 kva and flow coated on larger sizes. Three coats are cured by running tanks through controlled heat chambers. This "Sure Seal" finish is said to withstand all temperature changes and corrosive atmospheres.

Write U-405 on reply card, page 19.

Series of sockets offers single or double neutral

A NEW OCTAGONAL meter socket for 100 amperes, 600 volts, a-c, is now available from Anchor Manu-



facturing Co., Manchester, N. H.

This series of sockets offers open top #1/0 connectors, single or double neutral, two or three hubs from ¾-inch through 2-inch conduit sizes, and deep drawn and expanded aluminum can for greater room.

The socket is wired with 2 #1/0 wires yet there is ample room with this octagonal design.

Write U-406 on reply card, page 19.

Mercury luminaires have built-in ballast

A NEW LINE of mercury luminaires for street lighting is available from the Westinghouse Electric Corp., Edgewater Park, Cleveland,

Ohio. Designated the OV-25 Silverliner luminaires, the units are supplied with 400-watt mercury lamps, and are available with or without built-in ballast.

The new luminaires have one-piece die-cast aluminum housings, for high strength and low weight. The built-in-ballast model weighs 46 pounds; units without ballast weigh 20 pounds. Easily handled, the OV-25 Silverliners can be installed by one man.

Two duel-voltage regulated output ballasts are available. In the built-in-ballast model, the transformer and capacitor compartments are separated by a heat barrier to assure longer capacitor life. This model allows up to 60 per cent savings over the normal installation cost of similar equipment, since it reduces labor costs and eliminates the costs of transformer bases, pole-top fitters, and mounting bands.

Socket openings as well as reflector-refractor junctures are tightly sealed to prevent entrance of dust, dirt, moisture and insects, and to reduce cleaning and maintenance costs.

Write U-407 on reply card, page 19.

Stainless steel casting helps peel electric wires

A NEW STAINLESS steel casting is helping to peel the tough hide of electric wires, and in the process is making it safer and cheaper than methods used previously. Wire covering must first be removed to splice other wires or to do other work.

The new method was developed for Georgia Power Company (Atlanta, Ga.) by Penn-Union Electric Corp., Erie, Pa., with a stainless steel casting made by the Buffalo Plant of Al-

legheny Ludlum Steel Corp.

The peeler is simplicity itself in operation. To operate, the peeler is hooked over the wire or conductor, tightened by hand or with a hot stick (a 6-to-10 foot pole used by power companies for numerous jobs) until a stop is reached, then rotated around the conductor until the "chip" falls away. No nicks are possible since the cutter blade is correctly positioned by a built-in stop.

Linemen can now safely work on 12 kv conductors where formerly the electricity had to be cut.

There are 134 different type blades —all interchangeable—with the master peeler. Each blade is especially designed for one size conductor and one thickness of covering, cutting any insulation from 3/64-inch to 12/64-inch thick. However, since most power companies have only about a dozen different size conductors they need only that many separate types of blades.

Generally the operation, which used to take up to four hours, can now be completed in a few minutes without interrupting service on the line.

About one pound of Type 431 stainless steel is used with each blade.

Write U-408 on reply card, page 19.

Street light bracket redesigned, strengthened

BY THE ADDITION of a flat steel supporting strut between the pipe and round brace, the street light bracket #23208 has been improved by Hub-

bard and Co., 200 S. Michigan Ave., Chicago 4, Ill.

This added strength makes it suitable for use with 400-watt mercury vapor luminaires with built-in ballasts, it is reported.

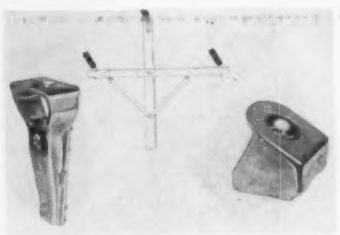
The bracket is of galvanized steel and can be attached to wood poles or to metal poles by using bands.

Write U-409 on reply card, page 19.

Accessories add economy to post insulator mounting

TWO NEW accessories designed to improve the convenience and economy of line post insulator mounting are announced by Pole Hardware Division of Malleable Iron Fittings Co., Branford, Conn.

One is the MIF pole top bracket P532, for use with post type insulators. Properly spaced teeth cast into the pole contacting surface of this



bracket provide efficient transfer of both vertical and transverse loads to the pole, help resist pole top splitting, and generally improve perform-

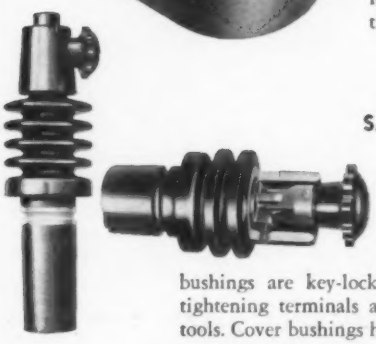
You get these Extra Values with Wagner Form W Transformers

Smaller size than ever before

Wagner's line of single phase pole-type distribution transformers has been redesigned to give you extra value from your transformer investment. One result of this redesign is a substantial reduction in size. The 25 kva Type HEK Transformer, for example, is now only 37 inches high —including the cover mounted bushings!

LOWER EXCITING CURRENT

The improved quality annealed steel core used in these transformers provides a low reluctance path for the magnetic lines of force to result in much lower exciting current. Lower impedance, better ratio of losses, and improved regulation have also been achieved.



SAFETY-KEYED BUSHINGS

Heavy wet process porcelain high voltage bushings are safety-keyed. All terminals are key-locked in the bushing porcelain—sidewall bushings are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. Cover bushings have insulated terminal guards to prevent outages caused by birds or animals. All bushing terminals are suitable for use with either aluminum or copper conductor.

LONGER LASTING TANK FINISH

A new formula anti-corrosive paint is hot spray applied on tank sizes below 50 kva—flow coated on larger sizes. A primer coat, intermediate coat and finish coat are each cured by running the tanks through a tunnel of infra-red lamps or through controlled heat chambers. The result is a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.

The complete line of pole-type transformers, from 3 to 167 kva is available from stock to meet your distribution system requirements.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6440 PLYMOUTH AVENUE, ST. LOUIS 14, MISSOURI

SERVING 2 GREAT GROWTH INDUSTRIES . . . *ELECTRICAL . . . AUTOMOTIVE*

WT59-4

ance on the pole.

Attachment of the insulator to the bracket is easy, due to the generous wrench room which permits tightening the insulator nut with standard wrenches. For added convenience, the lower attachment hole is slotted to compensate for minor vertical drilling errors.

The second item is the MIF angle transition piece P533, designed for use separately on crossarms or with MIF pole top bracket P532 on line angle structures. Both fittings are one-piece, tough, corrosion resistant malleable iron castings, hot dip galvanized. Illustrated literature which gives specifications and price information is available on request.

Write U-410 on reply card, page 19.

Testing equipment announced for extended-range meters

TEST RANGES of 30 amperes and three amperes for testing the new 30-ampere extended-range meters are provided with the watthour

meter-testing equipment by Knopp, Inc., 1307 66th St., Oakland 8, Calif. Type TE-9 adds the potential test-ranges of 208 and 277 volts to facilitate the testing of meters at those voltages when necessary.

All components of the equipment and the meter under test are completely grounded as a safety feature. Another feature speeds the testing of three-wire, single phase meters by making it possible to test both coils simultaneously without opening the potential link.

Write U-411 on reply card, page 19.

Convertible utility tap is multi-purpose device

CONVERTIBLE from open barrel construction to permanent closed barrel attachment, the A-MP Utili-Tap, distributed by American Pamcor, Inc., 181 Hillcrest Ave., Havertown, Pa., includes several special features.

An exclusive split barrel construction for controlled crimps prevent distortion and will not loosen or split. Crimped through barrel slots, locking tabs are permanently locked to barrel body by application tool. Corrosion resistance is provided by A-MP plating and inhibitor compound. Tensile strength is increased by inner barrel dimple serrations.

Among the uses for the tap are service drop at pole end, stirrup-type taps, and service drop at house end. The Utili-Tap is for aluminum and/or copper conductors. There is a full range of wire size combinations for aluminum, copper, or ACSR conductors.

Also distributed by American Pamcor are lightweight, matched crimping tools available in mechanical or hydraulic types.

Write U-412 on reply card, page 19.

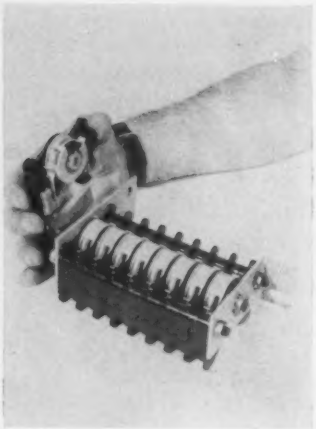
Auxiliary switch available for switchgear application

A NEW AUXILIARY switch (Q-10) for circuit breakers and switchgear applications has been announced by Allis-Chalmers, Milwaukee 1, Wis.

Smaller than its predecessor but having the same electrical rating, the switch permits shorter, narrower stackings for substantial space savings.

The new auxiliary switch can be individually adjusted in steps of 15 degrees in the field without disassembling or using special tools. This fine adjustment makes for a more flexible device. The previous switch could be adjusted in steps of 22½ degrees.

The new auxiliary switch is being used on the 4.16-kv Ruptair circuit breaker (Type MA), on the 600-volt, low-voltage air circuit breaker (Type LA), and is being adapted to



other Allis-Chalmers breaker lines.

The new switch is available for all secondary control voltages of 24, 48, 125, 250 volts d-c, and 110, 220, 440 volts a-c.

Write U-413 on reply card, page 19.

New insulating material on hot-line hand tools

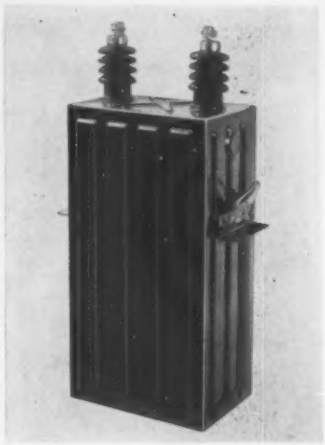
HOT-LINE hand tools, 1¼ inches in diameter feature poles of a new man-made insulating material called Epoxiglas. This material, developed by A. B. Chance Co., Centralia, Mo., consists of layers of epoxy-resin-coated glass fibers wound around and laid lengthwise over unicellular plastic foam core, and formed into a single unit by curing in an oven maintained at a constant temperature.

Expoxiglas poles reportedly have high insulation strength and moisture absorption resistance, and under normal conditions do not require heated trailers and drying rooms to maintain safe insulation level.

Write U-414 on reply card, page 19.

Capacitor units based on new design concept

NEW 100-KVAR capacitor units, based upon an entirely new design concept, are being manufactured by Line Material Industries, Milwaukee



1, Wis. These units are rated 2400 to 7960 volts.

Distinctive cooling ducts in the tank sidewalls and ends are indicative of the new concept of dielectric circulation. By developing this concept, L-M engineers were able to design relatively small, lightweight 100-kvar units. Dimensionally, the 100-kvar unit is only 1-3/16 inches taller than the 50-kvar unit; at 9⅛ inches, it is less than twice as wide; and at 185 pounds, it weighs 15 per cent less pounds per kvar. Like the 50-kvar unit, the 100-kvar unit has the same standard mounting dimension of 15⅝ inches and the same vertical dimension of 16 inches from the mounting bracket to the bushing terminal.

L-M's new units have been designed to meet all applicable NEMA standards for the performance and testing of shunt capacitors. They are impregnated with low-temperature "Elemex" suitable for operation from —40°C to +46°C. Stainless steel tanks, with solder-sealed bushings, have a primer and an alkyd resin paint finish for good heat dissipation.

Write U-415 on reply card, page 19.

EASY WAY
TO FINISH A JOB

Socket set screws furnished as standard. Hex head screws available on all fittings at no extra cost. L35 and L70 furnished with slotted screw to allow tightening with screwdriver.

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Contractors tell how

Safety training, a day-to-day, on-the-job task

By Thomas H. McCullen

Superintendent
Anderson and Estabrook, Inc.
Arlington, Va.

◆ WE ARE CONVINCED that safety training goes hand in hand with jobs as they are being carried out. It does little good to hand a mechanic a safety manual and ask him to read and follow the rules. Proper precautions are neither heeded nor learned through the written word removed from immediate experience and are not always recognized and applied when the situation arises.

Safety training classes conducted by Mr. Anderson, our president, are part of our training program for apprentices, but we find that it is also essential to repeat and repeat precautions day after day on jobs that turn up, observe and check that precautions are taken, and speak individually to mechanics who fail to take precautions for their own protection and safety.

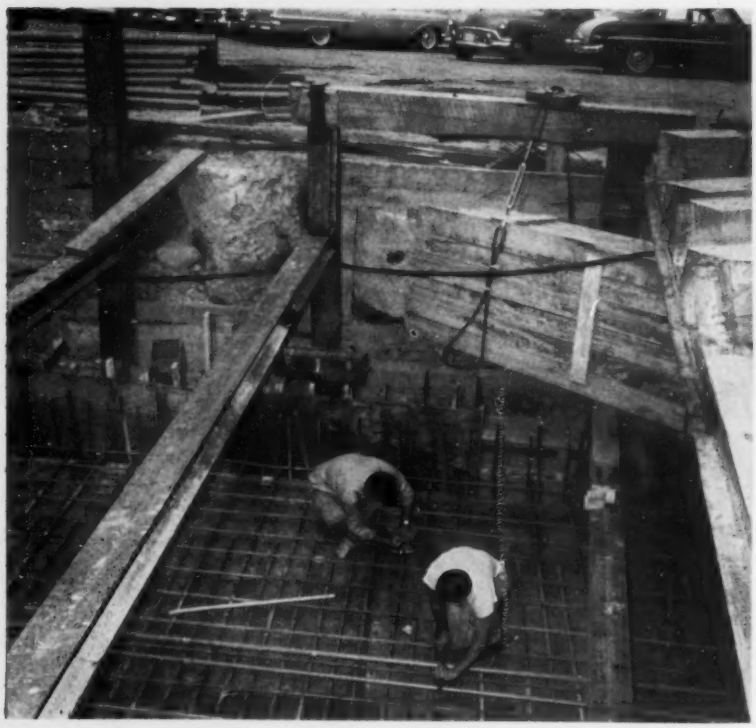
The greatest difficulty is to get the men to use the safety precautions furnished them. I feel very strongly that a mechanic's eyes must be protected from flying metal and concrete chips when electric drills, electric hammers and chisels are being used. Yet how many will use the large shield for protecting their eyes? I have encouraged those who do not use shields to use eyeglasses with unbreakable case-hardened lenses that are fitted into metal frames with metal guards at the sides. They may be seen in use by telephone company mechanics. Sturdy and dependable, these glasses are generally found more acceptable.

Like other contractors we record tool inventory and repairs in full detail as well as location of tool on a job. As a safety measure, and to increase tool life, we check every tool coming back from a job and recheck again before it goes out on the next job. On their return, tools are cleaned, lubricated, repaired, and, when necessary, replaced. Good tool maintenance keeps tools safe. We impress on our men in safety training to report at once a defective tool and keep it from use to prevent injury. Similarly we insist that they do not use a defective ladder.

Defective ladders do not take repairs. Attempts at repairing them only loosen them or get them out of alignment. A defective ladder has to be replaced. Yet again, the problem is keeping a man from climbing a defective ladder once he has discovered something is wrong with it.

Protecting hands is a precaution few mechanics take. Mechanics lose or forget gloves, or find them bothersome, that are meant to keep them from tearing the skin on their hands and scraping their knuckles when working with pipe or at new construction where they are reaching between reinforcing steel.

We believe we have solved this problem by getting the right type of glove that fits snugly and provides the proper protection. A general purpose glove, close fitting and of soft pliable leather, that we went to some effort to locate, is now accepted by our mechanics and worn constantly



Anderson and Estabrook's electricians install walkway lighting for the subway system between the Capitol Building and the old Senate buildings. Safety training classes have developed a high degree of safety consciousness on the part of this firm's workers.

and with satisfaction on the job. The gloves protect their hands in handling hot pipes in summer and very cold pipes in the winter. Though not adapted to fine work, they are the only gloves we have found acceptable to mechanics, and we have put in a stock of them.

To prevent shock from hot wires in large equipment, we provide a glove reaching to the elbow. Of tested rubber lining with outer covering of leather, the gloves do not slide in summer from sweating hands. They add warmth in winter. We provide asbestos gloves reaching beyond the wrist for protecting splicers who work with hot lead.

While most experienced mechanics wear heavy-soled workshoes reaching above the ankle on a job, occasionally a man will turn up with a thin-soled pair of loafers or other unsuitable street shoes. We have even seen sandals on a construction job. What protection can these shoes offer if he steps on a nail or a piece of wire, or if a heavy tool or piece of concrete drops on his foot? We insist that proper workshoes be worn and will not let a man continue on a job poorly shod, exposing himself to hazards.

For the safety of our men as well as meeting local ordinance requirements, we install three-wire polarized receptacles on equipment for grounding purposes.

To avoid heavy lifting, pushing, pulling, or transporting that can cause injury, we keep jobs equipped with dollys, handtrucks, rollers, pinch bars, and jacks. A truck winch is used for heavy lifting where needed. High voltage testers are used for testing switchgear and high lines. Precautionary testing takes place before an area is entered.

Behind our safety training program is an effort to indoctrinate the men with a point of view regarding their own personal safety. Toward this end we are ever alert, anticipating needed precautions, and reminding the men constantly to take measures for their own safety.

Heat pumps are new specialty for contractor

By P. T. Rasberry
Rasberry Electric Co.
Birmingham, Ala.

◆ OUR NEW SPECIALTY, developed this year, is handling the wiring on heat pump installations. We did all the wiring on all 15 houses included in the recent "Medallion Home" show held in Vestavia Hills. Participants in the show included Alabama Power Co., real estate concerns, contractors, and sub-contractors. In addition to these Medallion homes, we have handled a number of individual installations and have been consulted by several dealers on this type of equipment.

Installation of heat pumps is made simple by instructions that come with each piece of equipment. The local utility is very helpful when any problems do arise.

We find it requires two hours less time to wire heat pumps than to wire a conventional heating and air conditioning plant. Wiring a conventional system the other day, I found I had to take time to go to the supply house to obtain a relay switch. This is not likely to happen on a heat pump installation.

The medallion homes which have all electric appliances in the kitchen and laundry as well as electric heating and air conditioning are served by 200-ampere circuits with a 40-circuit panel board. This provides an ample number of circuits for the appliances and lighting as well as spares for future use. The heat pump has a #10/3 cable to the compressor, and #6/3 cable to the heating elements. The heat pumps are equipped with 10 kw supplementary heaters.

P. T. Rasberry shows the type of 40-circuit panel installed in the 15 Medallion homes wired by his company recently.

Recently we erected a new business headquarters which is centrally located to serve the residential areas of Birmingham. Most of our time is now taken up with new home construction and subdivision work, including 25 homes for Juno Homes in West End and 47 for Crestline Homes.

View of the new place of business of the Raspberry Electric Company, centrally located to serve residential areas in Birmingham.

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors ✔
Industrial Engineers ✔
Consulting Engineers ✔

◆ WE BEGIN Chapter 3 in our study of the Code. This chapter concerns wiring methods and materials. Although not so complicated as some of the later chapters, it has its difficult passages; and it is, of course, a very important chapter.

It begins with Article 300 which covers General Requirements for Wiring Methods. This is followed by an article on conductors, 22 articles on recognized wiring methods, 5 articles on wiring equipment, and a final article on prefabricated buildings.

Article 300 begins with a controversial fine print note which sometimes leads to arguments between conduit men and non-metallic sheathed cable advocates. This note states, "On premises where a continuous underground metallic water-piping network system is not available as a grounding electrode, and where it is not practicable otherwise to secure a ground of permanently low resistance, the use of a wiring method which does not employ metal enclosures for the wires is recommended, unless the character or occupancy of the building is such as to require the use of a metal-enclosed wiring system."

Now this does not say that a non-metallic wiring system is forbidden where water piping *is* available for grounding. And it does not say that a metallic wiring system is forbidden where water is *not* available. It is, first of all, only a recommendation. But in actual practice, the inspector could make it mandatory if its provisions were necessary for a safe installation. So it is worthwhile to understand what it means and to admit to one's self this meaning regardless of one's personal sentiments about pipe versus "Romex."

Where good grounding facilities, such as water piping, are available, both metallic wiring systems and non-metallic wiring systems are permitted unless there is a special reason for not permitting one or the other, such as the presence of explosive vapors which would forbid the use of non-metallic wiring methods and some forms of metallic wiring.

Where no water piping is available and *where it is not practicable to obtain another suitable grounding electrode of low resistance*, then the non-metallic wiring system is recommended. But if a hazardous condition exists, such as the explosive vapors just mentioned, which would forbid the use of a non-metallic wiring method, then a suitable metallic wiring method would be required. But adequate grounding would also be required even at great cost.

Code Test questions

1. Ferrous metal boxes protected from corrosion by enamel may be used outdoors if not subjected to severe corrosive influences. True or false?

2. If metal raceways are made of corrosive-resistant material they need not be further protected from corrosion by coatings. True or false?

3. The voltage limitation set by Chapter 3 of the Code is 300 volts between conductors and 150 volts to ground unless specifically limited to a lower voltage or unless a higher voltage is specifically permitted. True or false?

4. Meat-packing plants are not considered to be severely corrosive occupancies. True or false?

5. Round houses are considered to be severely corrosive occupancies. True or false?

6. Cable assemblies:

(a) shall be secured mechanically to metal boxes.

(b) may be supported within 8 inches of metal boxes instead of being attached to such boxes with connectors or clamps.

(c) may be secured within 4½ feet of metal boxes without further support.

Which is correct? a? b? c?

7. Non-metallic cable:

(a) shall be secured mechanically to non-metallic boxes.

(b) may be supported within 8 inches of non-metallic boxes instead of being attached to such boxes with connectors or clamps.

(c) may be secured within 4½ feet of non-metallic boxes without further support.

Which is correct? a? b? c?

8. At each outlet:

(a) conductors shall be cut as short as possible to prevent unnecessary crowding within the box.

(b) at least 6 inches of free conductor shall be left for connections and joints.

(c) excess wire shall be spiraled into a "pig tail" coil before connections are made.

Which is correct? a? b? c?

9. Conductors in wireways:

(a) shall not be spliced or tapped.

(b) may be spliced or tapped if inaccessible.

(c) may be spliced or tapped if accessible.

Which is correct? a? b? c?

10. Conductors in auxiliary gutters:

(a) shall not be spliced or tapped.

(b) may be spliced or tapped if inaccessible.

(c) may be spliced or tapped if accessible by means of removable covers or doors.

Which is correct? a? b? c?

Answers on page 137.

NEW RACO 4" SQUARE TILE COVERS

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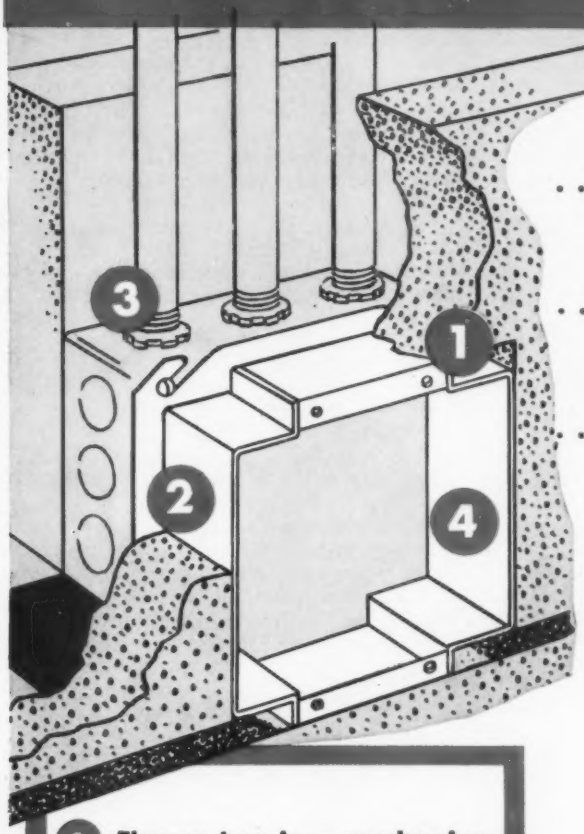

. . . . . eliminate drilling or chipping to clear mounting holes

. . . full range of depths-½" to 2" in single and two-device styles

. . . designed to provide a faster, neater installation

Raco 4" Square Tile Covers simplify and eliminate many installation problems. There's a range of depths in single and two-device for all types of wall thickness which provides a finished appearance and permits easier accessibility in wiring. Engineered for quick, easy mounting. Raco Covers have straight-side design which eliminates chamfering or beveling. Flanges are turned in, keeping device mounting holes from being plugged. This is a big advantage. Investigate the time-saving benefits.

1. **Flanges turn in — no plugging of device mounting holes**
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3. **Raco single or two-device tile covers fit any 4" square box**
4. **6 covers—choice of depths for every type wall construction**

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Two-Device Tile Cover

ALL-STEEL EQUIPMENT INC.
AURORA, ILLINOIS

It is my belief that there is no real misunderstanding in connection with this fine print note. The real trouble, it seems to me, is that some electricians have pronounced preferences in wiring methods and that they will not allow themselves to accept a Code rule which does not bear them out. Although such electricians are free to use their preferred wiring methods in most instances, they should not allow such preferences to cloud their understanding of the Code.

Some inspectors are not without guilt in this respect. Others are wont to restrict all installations to one or two methods because it is difficult for them to absorb all of the involved rules governing the many and varied wiring methods which are recognized by the Code as safe. It is hoped that this series of discussions on all of the wiring methods recognized by Chapter 3 of the Code will be of some benefit to all who sincerely wish to understand them.

General requirements

Certainly, no one would deny that some of the wiring methods recognized by the Code are far superior to others. But all are suitable *when restricted by applicable Code rules.* What are these restrictions and permitted uses? They are stipulated in the Code for each method, and each will be discussed in turn. But first we will discuss the General Requirements for Wiring Methods which " . . . apply to all wiring installations, except for remote-control, low-energy power and signal systems as provided in Article 725, and communication systems as provided in Article 800."

A fine print note following section 3001 reminds us that these general rules " . . . are not intended to apply to the conductors which form an integral part of equipment such as motors, motor controllers and the like." Like many other fine print notes, this one tends to antagonize some electrical men who lean toward the belief that a wire is a wire regardless of who uses it or where it is used.

These men, which include a small number of contractors, electricians, and inspectors, feel that if a certain size wire is not permitted to carry a given value of current in some instances, the same size wire should not be permitted to carry the same value of current anywhere else. They believe that what is safe for the goose is safe for the gander, and that what is not safe for one is not safe for the other. A moment's reflection, however, will reveal the folly of this thinking.

A case in point is the size of motor branch circuit conductors as compared to the size of the motor leads furnished as an integral part of the motor. If you believe that motor leads should be the same size as motor branch circuit conductors, would you go a step further and insist upon the motor winding being of equal size? Or would you want the cross section of a fuse link to be equal to the cross section of the conductor which it is supposed to protect? How about the filament in an incandescent lamp? Must this, too, be a minimum of size No. 14 wire? It is evident, upon reflection, that *the intended function is a factor in determining size.*

Such integral equipment is laboratory tested and found to be suitable and safe for its intended use. Wiring installations to this equipment are different matters entirely. That is why the Code differentiates, by means of this fine print note, between wiring methods to the equipment and the wiring which is integral with such equipment.

Another frequent complaint among electricians which is a "legitimate gripe" is about the size of the motor terminal connection enclosure, sometimes termed a "service head." (Not weather head.) This enclosure for most motors appears to have been designed as though the branch circuit conductors were to be the same size as the motor terminal leads. They are too small in most instances, especially on the larger size motors, to enable the electrician to make his joints and replace the cover. Many of these enclosures have to be enlarged in the field at the time of installation. If this long-standing and very annoying practice were corrected in the factory, it would be an improvement more than welcomed in the field.

Voltage restrictions

All of the wiring methods which are recognized by the Code are suitable for use on 600 volts except the ones which are specifically limited to a lower voltage by Chapter 3. Some may be used for potentials higher than 600 volts if specifically permitted for a higher voltage by a section of the Code governing the installation in question.

As one example in each instance, non-metallic surface extensions are limited to 150 volts between conductors by the provisions of Chapter 3. Rigid metal conduit is permitted to be used for potentials greater than 600 volts by the provisions of section 7105. The limitation of voltages is one of the most important provisions of the Code. The limits set should never be exceeded.

Protection against both corrosion and mechanical injury for both conductors and equipment is required by section 3003. Coatings, such as galvanizing, are used for protection against corrosion generally. Special coatings for protection against specific and severe corrosive elements are required where needed. A sample listing of occupancies where severe corrosive influences are likely to be encountered are included in the fine print note following section 3003.

Such special coatings include plastics. Special non-corrosive metals and alloys are sometimes used instead of non-corrosive coatings for such protection where needed. Brass, copper, and Everdur steel are among such special metals occasionally used. Mechanical protection is provided by various methods, but usually by means of metal raceways. All equipment, raceways, cable, and wiring is required to be securely fastened in place.

A controversial section

Section 3005 is a very controversial section. Even when two people *appear* to be in agreement, they actually may be talking about two different things when this section is the subject. It states, "Raceways and cable assemblies shall be continuous from outlet to outlet and from fitting to fitting. Conductors shall be continuous from outlet to outlet and, except as permitted for auxiliary gutters in section 3748, and for wireways in section 3625, there shall be no splice or tap within the raceway itself.

There is usually no misunderstanding in regard to the statement about raceways. Although the Code permits isolated sections of raceway for mechanical protection of parts of non-metallic wiring systems, this requirement

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M5-L Load transfer thermostat; prevents overloading when two heaters are supplied from one circuit. 22A, 125-250V AC.

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for raceways to be continuous from outlet to outlet and from fitting to fitting when the raceway is to be complete as a wiring method is well understood.

The parts which are not always understood are those parts which refer to cable assemblies running from outlet to outlet and from fitting to fitting and which refer to conductors which are to be run from outlet to outlet. To some, this means from plug to plug, from plug to switch to light, from light to light, etc., with *junction boxes ruled out.* To some, even switch boxes are ruled out. To others, this simply means from box to box, *including* junction boxes, *the restriction applying only to splices in raceways* except as permitted for gutters and wireways.

Therefore, both groups agree that conductors must be continuous from outlet to outlet and from fitting to fitting, but one group differs from the other on what constitutes an outlet and what constitutes a fitting.

Article 100 defines a *fitting* as follows: "An accessory such as a locknut, bushing or other part of a wiring system which is intended primarily to perform a mechanical rather than an electrical function." Clearly, this definition does not include the type fitting which is referred to in this section. This adds to the confusion, somewhat. But the fittings referred to were *meant,* no doubt, to refer to conduit fittings such as "Condulets."

Article 100 defines *outlet* as follows: "A point on the wiring system at which current is taken to supply utilization equipment." Of course, utilization equipment is equipment which uses the current. This would exclude a junction box. On the other hand, "a point on the wiring system *at which current is taken to supply* utilization equipment" could very easily be a junction box. It frequently is.

Junction box use

Those who oppose the use of junction boxes usually oppose their use in residence wiring where armored cable or non-metallic sheathed cable is the wiring method. Certainly a better wiring job is obtained in the majority of such cases without the use of junction boxes. Occasionally, a job with many points of control will be difficult to install without the use of one or two junction boxes unless the number of conductors

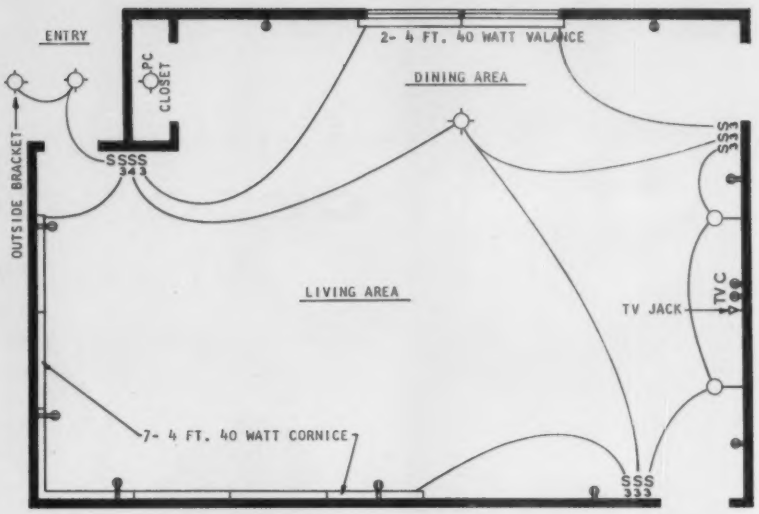

Figure 1—In addition to lighting with controls as shown, there are numerous receptacles in this room. A minimum of one 3-wire, 20-amp. circuit or two 2-wire, 20-amp. circuits are required. Three 2-wire circuits or the equivalent should be used. One or even two junction boxes would not be excessive and would not be in violation of the Code.

in some of the boxes is excessive or unless the amount of wire used is much greater. But, generally speaking, junction boxes are better left out of residence wiring.

However, it is decidedly more difficult to eliminate them entirely from all wiring installations. Frankly, I doubt if it will be attempted. And to eliminate them from residences only could not be easily justified. At any rate, as the Code is now written, an inspector who rejected an installation by reason of its having junction boxes would be on shaky ground in my own opinion.

An installation which had an *excessive* number of junction boxes, however, such as a residence with numerous such unneeded junction boxes, could be rejected, in my opinion, by reason of its being an unworkmanlike installation. This could be justified easily because of the *unnecessary* joints and connections which could act as additional resistance and heat sources. A job is required to be made reasonably safe. Numerous joints, *if not necessary,* could be rejected on the grounds that unnecessary hazards were introduced into the system. (See Figure 1).

In all outlets for whatever use, not less than 6 inches of free conductor must be left for making up joints and terminal connections

(Continued on page 137)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department.)

Automatic resetting trips discussed

QUESTION: I installed a motor with an automatic resetting trip. I've been told that this is not Code. Will you please state Code requirements for this?

ANSWER: Section 4333 states, "Automatic Resetting. A motor-running protective device which can restart a motor automatically after overcurrent tripping shall not be installed unless approved for use with the motor which it protects. A motor which can restart automatically after shutdown shall not be installed so that its automatic restarting can result in injury to persons."

The first sentence in this section forbids an automatic restarting trip to be installed on any motor unless it has been approved as a part of and specifically for the motor in question. The second sentence of this section forbids the installation of a motor which has an approved automatic restarting trip if injury may result from this automatic restarting.

The answer to your question, then, depends upon two other questions: (1) Could the motor re-

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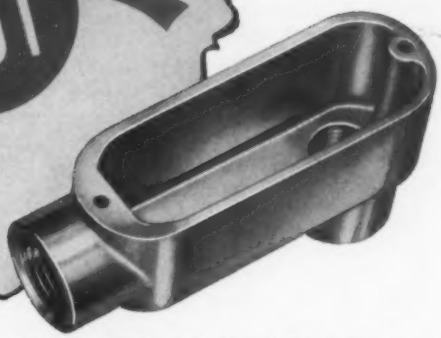

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sult in injury if it unexpectedly restarted? (2) Was the automatic restarting trip in question approved for the motor in question? If the answer to (1) is "No" and to (2) is "Yes," then your installation meets Code requirements insofar as automatic restarting is concerned.

For example, a circulating pump on a powerhouse condenser or on an air-conditioning unit could do no harm by automatically restarting. A circular saw could be very hazardous. The majority of motors should remain stopped until manually restarted.

Effect of capacitors on motor protection

QUESTION: I wish to install capacitors on a motor load to increase my *full load* power factor to at least 95%. Section 4606 limits the size of capacitors according to a *no load* value. Since I want this installation to comply with the Code, I would like an explanation of this section. I am also totally confused with what appears to be a contradiction between section 4607-b and section 4608, both of which refer to motor overcurrent protection for motors equipped with capacitors. Will you please explain these two sections also?

ANSWER: Section 4606 states, "The total kvar rating of capacitors which are connected on the load side of a motor controller shall not exceed the value required to raise the no-load power factor of the motor to unity."

The kvar ratings which will raise the no-load power factor to unity usually will result in a full-load power factor of from 95 per cent to 98 per cent. However, I strongly urge that you send the motor manufacturer the name plate data on the motor or motors in question. This manufacturer will then give you the maximum size capacitors which should be used and the maximum size overcurrent devices which should be used.

The confusion which you have experienced from sections 4607-b and 4608 is a result, I think, of a misunderstanding of the first mentioned section 4607-b, which states, "An overcurrent device shall be provided in each ungrounded conductor, except that an overcurrent device is not required for a capacitor connected on the load side of a motor overcurrent device. The rating or setting of the overcurrent device shall be as low as practicable without causing unnecessary opening of the circuit. A rating or setting of 165 to 250 per cent of the rated current of the capacitor will be suitable under average conditions although the setting or rating may have to exceed 250 per cent in some cases."

Section 4608 states, "If a motor installation includes a capacitor connected on the load side of the motor overcurrent device, and the overcurrent device used can be adjusted, the rating or setting of the motor overcurrent device shall be determined as provided in section 4322 except that instead of using the full-load rated current of the motor as provided in that section a lower value corresponding with the improved power-factor of the motor circuit shall be used. Section 4312 applies with respect to the rating of the motor circuit conductors."

Now, taken as quoted, there does appear to be a contradiction, or at least something less than agreement, between these two sections. This apparent contradiction or confusion results from a very common error in reading the Code. The error is simply a matter of ignoring or of overlooking the subject headings. The two sections actually are referring to two different things. In your question you stated, " . . . both of which refer to motor overcurrent protection for motors equipped with capacitors." Actually only section 4608 refers to motor overcurrent protection. And the heading for this section is: *Rating Or Setting Of The Motor Overcurrent Device*. The heading for section 4607 is: *Capacitor Circuits*. This has three sub-headings a, b, and c. The sub-heading *b* is: *Overcurrent Protection*. This sub-heading, of course, refers to the main heading, *Capacitor Circuits*. To understand the Code, these headings must be observed carefully.

Section 4607-b, then, tells us the size of overcurrent protection for capacitors when the capacitors are connected *ahead* of the motor overcurrent device. It also tells us that separate overcurrent protection for capacitors is not required when the capacitors are connected on the *load* side of the motor overcurrent device.

Section 4608 tells us that motor conductor sizes are determined in the usual manner when capacitors are connected on the load side of the motor overcurrent device, but that the motor overcurrent device, itself, must be determined according to the lowered current value resulting from the improved power factor. The reason for this is that a power-factor correction causes less current to flow through the motor overcurrent device. The device must therefore be reduced in size or setting in order to give the required overload protection for the motor.

I hope this "answer" has enabled you to understand the basic Code rules underlying your problem. But I must repeat that the answer to your immediate problem of determining the maximum size of the capacitors and of the motor overcurrent devices for your particular application should be obtained directly from your motor manufacturer.

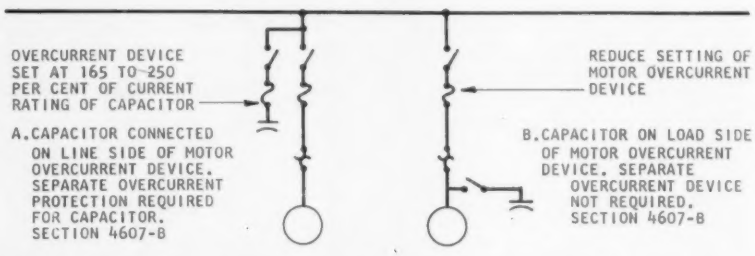
OVERCURRENT DEVICE SET AT 165 TO 250 PER CENT OF CURRENT RATING OF CAPACITOR
A. CAPACITOR CONNECTED ON LINE SIDE OF MOTOR OVERCURRENT DEVICE. SEPARATE OVERCURRENT PROTECTION REQUIRED FOR CAPACITOR. SECTION 4607-B
REDUCE SETTING OF MOTOR OVERCURRENT DEVICE
B. CAPACITOR ON LOAD SIDE OF MOTOR OVERCURRENT DEVICE. SEPARATE OVERCURRENT DEVICE NOT REQUIRED. SECTION 4607-B

Figure 2—When the capacitor is connected as in B, the motor overcurrent device is required to be reduced in size or setting because of the reduced current after the power-factor correction—section 4608. The total line current before correction consists of both working current (kw) and motor magnetizing current (kvar). If a capacitor is installed to furnish all or a part of the magnetizing current, the resulting line current passing through the motor overcurrent device is reduced. Hence, the overcurrent device itself must be proportionately reduced in order to protect the motor.

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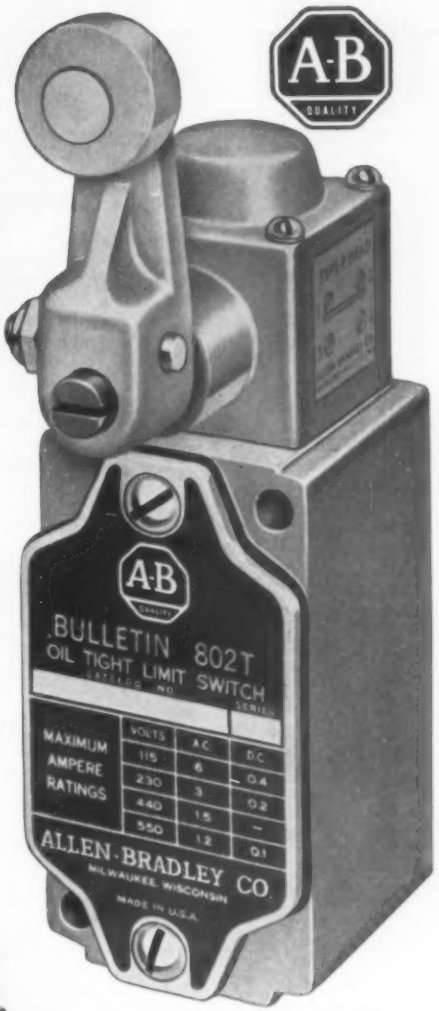

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New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

SERVICE HEADS
CABLE

CABLE SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
2/12	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
2/10	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
2/8	.42	.53	.63	.74	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58
2/6	.47	.59	.71	.82	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76
3/12	.42	.53	.63	.74	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58
3/10	.47	.59	.71	.82	.94	1.06	1.18	1.29	1.41	1.53	1.65	1.76
3/8	.53	.66	.80	.93	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99
3/6	.63	.79	.95	1.10	1.26	1.42	1.58	1.73	1.89	2.05	2.21	2.36
2/4	.63	.79	.95	1.10	1.26	1.42	1.58	1.73	1.89	2.05	2.21	2.36
3/4	.74	.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78

E-101-B

LABOR: INCLUDES DISASSEMBLY, ASSEMBLY TO CONDUIT OR CABLE, SECURING AND RE-ASSEMBLY.

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MECHANICAL CONNECTORS

WIRE SIZE	HOURS EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
8	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
6	.38	.48	.57	.67	.76	.86	.95	1.05	1.14	1.24	1.33	1.43
4	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
2	.49	.61	.74	.86	.98	1.10	1.23	1.35	1.47	1.59	1.72	1.84
1/0	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03
2/0	.59	.74	.89	1.03	1.18	1.33	1.48	1.62	1.77	1.92	2.07	2.21
3/0	.65	.81	.98	1.14	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44
4/0	.70	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
250 MCM	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
300 "	.86	1.08	1.29	1.51	1.72	1.94	2.15	2.37	2.58	2.80	3.01	3.23
350 "	.92	1.15	1.38	1.61	1.84	2.07	2.30	2.53	2.76	2.99	3.22	3.45
400 "	.97	1.21	1.46	1.70	1.94	2.18	2.43	2.67	2.91	3.15	3.40	3.64
500 MCM	1.03	1.29	1.55	1.80	2.06	2.32	2.58	2.83	3.09	3.35	3.61	3.86
750 "	1.1	1.38	1.65	1.93	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13
1000 "	1.2	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
1250 "	1.24	1.55	1.86	2.17	2.48	2.79	3.10	3.41	3.72	4.03	4.34	4.65
1500 MCM	1.3	1.63	1.95	2.28	2.60	2.93	3.25	3.58	3.90	4.23	4.55	4.88
1750 "	1.4	1.75	2.10	2.45	2.80	3.15	3.50	3.85	4.20	4.55	4.90	5.25
2000 "	1.5	1.88	2.25	2.63	3.00	3.38	3.75	4.13	4.50	4.88	5.25	5.63

E-101-B

LABOR: INCLUDES STRIPPING CONDUCTORS, ASSEMBLY OF FITTING, AND TAPING JOINT.

4-59

SUPPORTS CONDUCTOR VERTICAL IN PIPE

COND. SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1"	.65	.81	.98	1.14	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44
1 1/4"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
1 1/2"	.81	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
2"	.81	1.01	1.22	1.42	1.62	1.82	2.03	2.23	2.43	2.63	2.84	3.04
2 1/2"	.86	1.08	1.29	1.51	1.72	1.94	2.15	2.37	2.58	2.80	3.01	3.23
3"	.92	1.15	1.38	1.61	1.84	2.07	2.30	2.53	2.76	2.99	3.22	3.45
4"	1.03	1.29	1.55	1.80	2.06	2.32	2.58	2.83	3.07	3.35	3.61	3.86
5"	1.2	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
6"	1.3	1.63	1.95	2.28	2.60	2.93	3.25	3.58	3.90	4.23	4.55	4.88

E-101-B

LABOR: INCLUDES INSTALLATION OF FITTING AND LOCKING FEET OR SLEEVES.

4-59

Electrical Estimating—III

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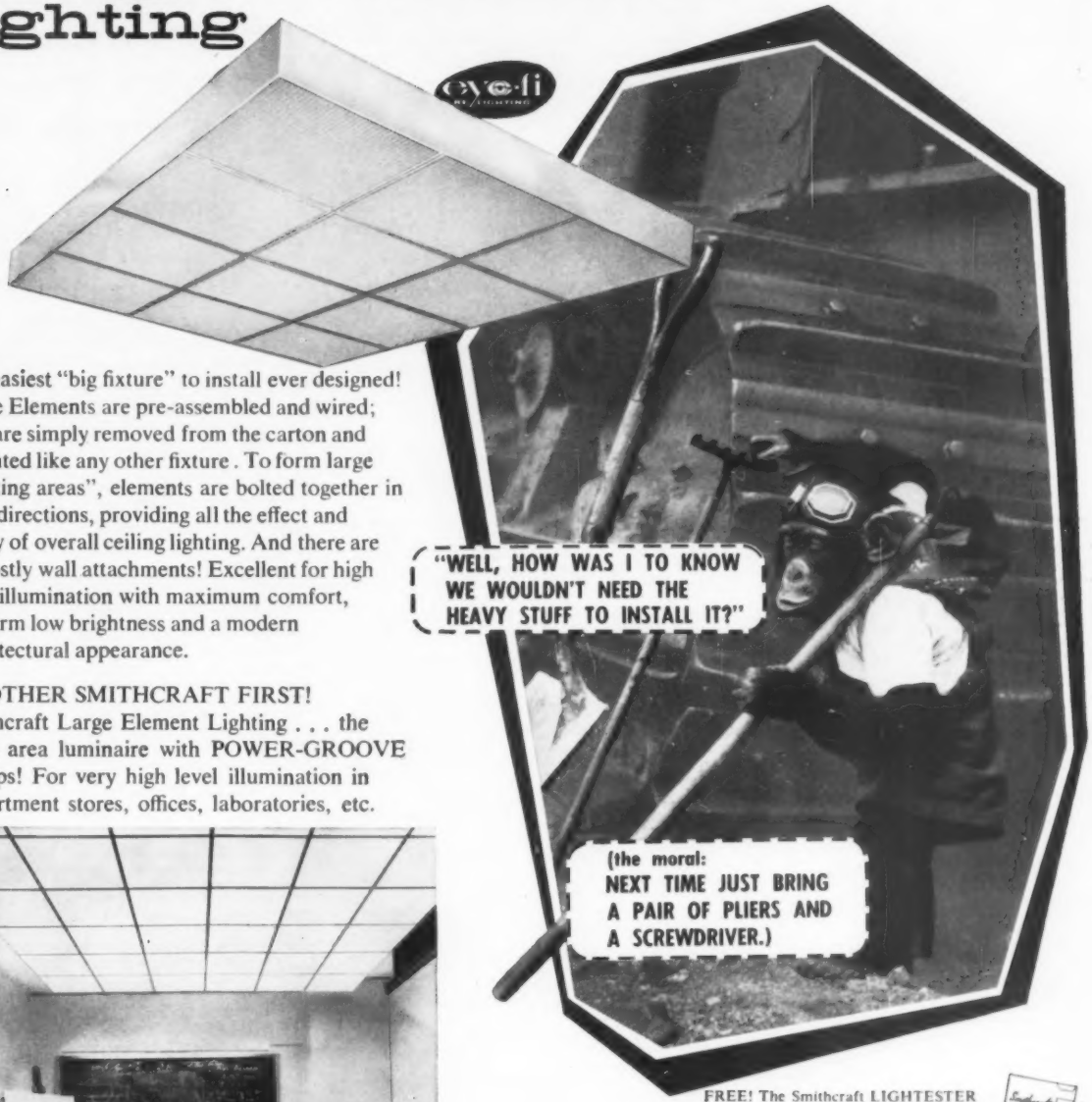
Smithcraft large element lighting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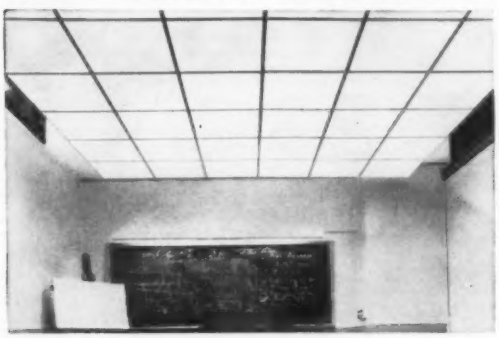

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NECA, North Louisiana Chapter. F. J. Evans, Manager, 753 Dalzell St., P. O. Box 1210, Shreveport, La.

NECA, Maryland Chapter. Robert L. Higgins, Manager, American National Bldg., Room 305, 204 North Liberty St., Baltimore 1, Md.

NECA, Central Mississippi Chapter. John C. Sullivan, Manager, 970 Milner Bldg., Jackson, Miss.

NECA, Greater Kansas City Chapter. Phil A. Koury, Manager, 2201 Grand Ave., Kansas City 8, Mo.

NECA, St. Louis Chapter. R. E. Vierheller, Manager, 4657 Hampton Ave., St. Louis 9, Mo.

NECA, Carolinas Chapter. D. L. Casey, Manager, P. O. Box 4056, Charlotte 4, N. C.

NECA, Western Oklahoma Chapter. Tom M. Rushing, Manager, 616 N.W., 5th St., Oklahoma City 3, Okla.

NECA, East Oklahoma Chapter. Johnny G. Hicks, Manager, 1519 S. Boston, Tulsa, Okla.

NECA, East Tennessee Chapter. Catherine S. McDonald, Acting Manager, 1007 James Bldg., Chattanooga 2, Tenn.

NECA, Knoxville Chapter. W. G. Hoffman, 312 West Jackson Ave., Knoxville 24, Tenn.

NECA, Memphis Chapter. Raymond Calhoun, Manager, 170 Neil St., Memphis 12, Tenn.

NECA, Nashville Chapter. B. V. Lawson, Manager, 1509 Laurel St., Nashville 4, Tenn.

NECA, Panhandle Chapter. John H. Burt, Manager, P. O. Box 2283, Amarillo, Tex.

NECA, Central Texas Chapter. N. E. Busby, Manager, P. O. Box 881, Austin, Tex.

NECA, Texas Gulf Coast Chapter. Ray P. Hayes, Manager, P O. Box 2049, Corpus Christi, Tex.

NECA, Northeast Texas Chapter. L. E. Martin, Manager, 1923 McKinney Ave., Dallas 1, Tex. RayP.L.E.Martin,

NECA, El Paso Chapter. John E. Blaine, Manager, 310 San Francisco St., El Paso, Tex.

NECA, North Texas Chapter. C. E. Wann, Manager, Westchester House, Apt. 102, 554 South Summit, Fort Worth, Tex.

NECA, Southeast Texas Chapter. Charles Scholibo, Manager, 4218 Yoakum Blvd., Houston 6, Tex.

NECA, East Texas Chapter. Harry L. Wren, Manager, 412 Southwest Reserve Bldg., P. O. Box 1345, Longview, Texas.

NECA, West Texas-New Mexico Chapter. Aubrey E. Rummel, Manager, 105 College Ave., P. O. Box 121, Lubbock, Texas.

NECA, Heart of Texas Chapter. Fred E. Lewis, Jr., Manager, 1825 Austin Ave., Waco, Tex.

NECA, South Texas Chapter. Frank R. Stewart, Manager, 774 East Locust St., San Antonio 12, Tex.

NECA, Rio Grande Valley Chapter. R. N. Cummings, Manager, 607 West 4th St., Weslaco, Tex.

NECA, Virginia Chapter. Richard R. Smouse, Manager, 203 Roslyn Hills Dr., Richmond 26, Va.

NECA, West Virginia-Ohio Valley Chapter. Richard G. Dye, Manager, 510½ C St., South Charleston, W. Va.

INSPECTORS

International Association of Electrical Inspectors. Headquarters, Charles L. Smith, Secretary-treasurer, 612 N. Michigan Ave., Chicago 11, Ill.

IAEI, Alabama Chapter. Hugh Roberts, Secretary-Treasurer, Alabama Power Co., 2100 South 21st St., Birmingham, Ala.

IAEI, Florida Chapter. R. H. Wellwood, Secretary-Treasurer 2605 11th Ave., NW., Bradenton, Fla.

IAEI, Georgia Chapter. C. R. Minors, Secretary-Treasurer, P. O. Box 1719, Atlanta, Ga.

IAEI, Kentucky Chapter. E. H. Rueppel, Secretary-Treasurer, 201 Citizens Bldg., Louisville 2, Ky.

IAEI, George Welman Chapter. J. Clifton Young, Secretary-Treasurer, 317 Baronne St., New Orleans 9, La.

IAEI, North Louisiana-East Texas Chapter. Kenneth D. Hightower, 1718½ Centenary Blvd., Shreveport, La.

IAEI, Mississippi Chapter. C. B. Grauer, Secretary-Treasurer, P. O. Box 1790 Jackson, Miss.

IAEI, Missouri-Kansas Chapter. T. McGinnis, Secretary-Treasurer, City Hall, Topeka, Kan.

IAEI, St. Louis Chapter. Neil W. Butteiger, Secretary-Treasurer, 7427 Canton Ave., University City 14, Mo.

IAEI, , North Carolina Chapter. C. S. Whitaker, Secretary-Treasurer, City Hall, Durham, N. C.

IAEI, Oklahoma Chapter. T. C. Wier, 1907 W. 41st St., Tulsa, Okla.

IAEI, South Carolina Chapter. N. R. Darling, Secretary-Treasurer, P. O. Box 390, Columbia, S. C.

IAEI, Tennessee Chapter. R. E. Ward, Div. of Fire Prevention, 102 State Office Bldg., Nashville 3, Tenn.

IAEI, Texas Chapter. R. L. Payne, Secretary-Treasurer, 3303 Schley St., Dallas, Tex.

IAEI, Texas Gulf Coast Chapter. M. W. McRaven, Secretary-Treasurer, P. O. Box 1700, Houston 1, Tex.

IAEI, Southern Section. A. M. Miller, Secretary, 910 West 30th St., Richmond 25, Va.

IAEI, Virginia Chapter. A. M. Miller, Secretary, Treasurer, 910 West 30th St., Richmond 25, Va.

IAEI, West Virginia Chapter. H. L. Parks, Secretary-Treasurer, P. O. Box 626, Charleston, W. Va.

MOTOR REPAIR SHOPS

National Industrial Service Association, Inc. Joseph M. Harrington, Executive Secretary, 818 Olive St., St. Louis 1, Mo.

NISA, Southeastern Chapter. Mrs. Virginia Oehmann, Executive Secretary, 19 N. W. Fifth St., Fort Lauderdale, Fla.

NISA, Electric Motor Service Association of the District of Columbia. John W. Lainhart, Secretary, 913 E. St., NW, Washington 4, D. C.

NISA, Louisville Chapter. W. C. Krauth, Secretary, 118 S. 1st St. Louisville, Ky.

NISA, New Orleans Chapter. William Dreis, Secretary, 1517 Calliope St., New Orleans, La.

NISA, Mid-South Chapter. Murphy G. Miller, Secretary, 109 Jennings Ave., Knoxville 17, Tenn.

NISA, Southwestern Chapter. George Foshee, Secretary, 203 S. Main, Fort Worth 4, Tex.

NISA, Electric Club of West Virginia. O. E. Jenkins, Secretary c/o Guyan Machine Co., Logan, W. Va.

"Permit me to congratulate you on the production of a fine light . . ."

Charles A. Comiskey

APPLETON

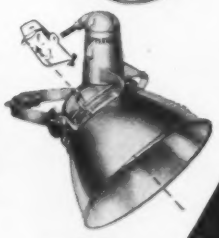
INTENSO

TRADE MARK

Alzac Aluminum Floodlights

FOR ATHLETIC FIELDS and OTHER LARGE AREAS

Split-Second Rear Relamping—No tools needed! No nuts or bolts! Rear lid with lamp opens wide for easy access! Do it in seconds even during a game!



Rifle Like Aiming—After servicing, just flip lid down and clamp! Unit now weather sealed, perfectly! Exclusive louver ventilation eliminates condensation! Aim merely by looking through peep sight, then locking in position!

New APPLETON Lights at Famed Comiskey Park in Chicago Turn Night into Day! 768 *Intenso* floodlights mounted on eight towers give daylight visibility to the entire field. No wonder Charles A. Comiskey says "... the new White Sox lighting is unequalled anywhere in the Major Leagues ..."

In addition, APPLETON *INTENSO* Floodlights offer greater ease of servicing, cleaning, relamping and positioning for maximum trouble-free year 'round lighting. That's why we say, investigate APPLETON *INTENSO* Floodlights before you buy!

Sold Through Franchised Distributors Only

APPLETON ELECTRIC COMPANY
1704 Wellington Avenue • Chicago 13, Illinois

APPLETON ELECTRIC PRODUCTS REG. U.S. PAT. OFF.

Also Manufacturers of:

Rely on **APPLETON** *... The Standard for Better Lighting*

News of the industry

edited for Southern readers

Utility president says power industry booming

SPEAKING to more than a thousand sales executives of the nation's investor-owned electric utility companies gathered in Chicago for the 25th Annual Sales Conference of Edison Electric Institute, J. E. Corette, president of the Institute and president of the Montana Power Company revealed that earnings of electric power companies in 1958 were higher than in 1957. During the recession of 1958, Corette said, total corporate profits of all industries dropped 30 per cent—one of the sharpest declines in history. However, earnings of investor-owned electric utilities were, as a whole, better than in 1957, Corette stated, gross revenues rising $362 million and net income $107 million.

In a year when business investment for all other industries declined from $37 to $31 billion, expenditures of investor-owned electric companies for new construction reached an all-time high of $3.8 billion, according to the power company executive. Wages and salaries, which fell off about 2 per cent in all industries in 1958, rose about 5 per cent in the electric power industry. Another significant fact that Corette brought out at the meeting is that more kilowatts of generating capacity were installed during '58 than the whole electric industry had in operation in 1920. The record installation during the year totaled more than 14 million kilowatts. The power company president also stated that the electric utility industry added a million new customers to bring total electric customers of investor-owned power companies to 56.2 million, of which 85 per cent are in the residential category.

Corette went on to describe the efforts being made by the industry to hasten the time when economic electricity will be produced from nuclear fuels. One hundred and thirty-one electric utility companies were participating in one or more of 26 nuclear power research, development and construction projects or studies by the end of 1958. Fifteen construction projects are now in hand, Corett said, of which three are now in operation producing power that is being utilized on company systems. These projects involve a total investment of more than $540 million, he added.

The president of Edison Electric Institute predicted continued growth for the electric power industry through 1959 and the years ahead, and expects a million new electric customers this year and around 14.5 million kilowatts of additional generating capacity. Today more than ever before, Corette believes, electric utilities offer high returns on the investor's dollar, with long-term growth potential.

Adequate wiring award winners announced

THE SOUTH was well represented among those who received *Look* Magazine Adequate Wiring Awards at the 15th Annual Conference of the National Wiring Bureau at the Hotel Jung in New Orleans recently. Four members of the electrical industry were presented with awards—known as the "Oscars" of the electrical industry—for "outstanding achievement in the promotion of adequate wiring."

Baltimore Gas and Electric Co., Baltimore, Md., received the Community Service Award for Utility Companies serving over 250,000 meters.

The Sales Promotion Award for Electrical Contractors went to Robert C. Marshall, Ltd., Electrical Contractors in Washington, D. C.

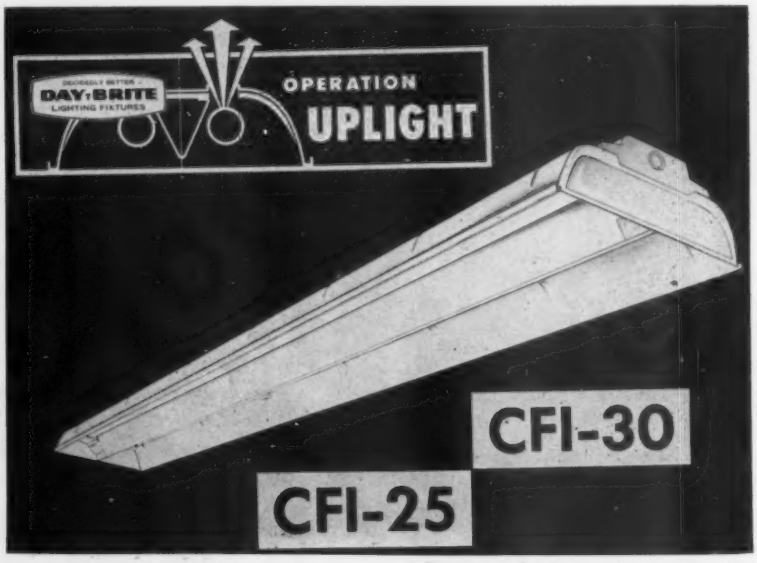
Among the industry members receiving Honorable Mention awards were: Kentucky Utilities Co., Lexington, Ky., (Utilities serving under 250,000 meters) and Centralite Supply Co., Newport News, Va., (Distributor).

The awards, which were inaugurated by *Look* five years ago, are designed not only to honor industry members for successfully fighting the problem of inadequate wiring — which is regarded as the basic barrier to continued growth of markets for electrical products and services— but also to encourage more future activity against the inadequate wiring problem.

New IES lighting levels studied by Day-Brite

OPERATION UP-LIGHT, a program designed to bring the new Illuminating Engineering Society recommended lighting levels to industry at lower cost, was recently announced by James F. Whitehead, executive vice-president of Day-Brite Lighting, Inc.

According to Mr. Whitehead, Day-Brite has completed a thirty month test to evaluate the in-use performance of industrial lighting fixtures. A comparison of solid top, 10 per cent up-light, and 25 per cent up-light reflectors was made. The results of the test proved conclusively that fixtures with 25 per cent up-light provided a given footcandle level with fewer fixtures than solid top or 10 per cent up-light luminaires. Findings also showed that 25 per cent up-light equipment stayed cleaner, maintained higher lighting efficiency



Day-Brite's Operation Up-Light is a new program designed to bring the new IES recommended lighting levels to industry at lower cost.

Note how ordinary EMT split early in pressure test while induction welded CIRTUBE EMT (shown here unplated) held fast, surpassing UL requirements.

BETTER WELDING

on new CIRTUBE EMT means easier, split-free bending

THERE are many reasons why new CIRTUBE EMT will help you get faster, cleaner wiring jobs. Most of them are listed here.

One *big reason*, however, is *continuous induction welding*—by far the best technique available for making bead-free, split-free welds on high quality EMT.

It is virtually impossible to split an induction-welded EMT no matter how severe the bends. And the perfectly clean weld means uniform roundness—easier, neater bending without the slightest kink or flattening. Your men get it right the first time around.

Try induction-welded new CIRTUBE EMT soon as you can. Your wholesaler has it now—bundled with distinctive orange colored tape to identify the EMT manufactured to Circle's quality standards.

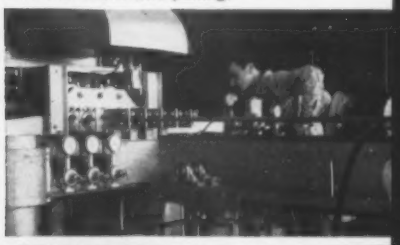
CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** in all principal cities
RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CIRTUBE EMT *Ask for it!*

Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.



Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Automated quality control! Automatic controls assure complete and continuing uniform quality of product.

Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

longer, and had greater visual comfort.

Whitehead went on to say that by complete re-engineering of the product, by utilizing new technological and manufacturing processes, Day-Brite will effect savings that allow price reductions ranging from 7 per cent to 17 per cent on the company's CFI-25 and CFI-30 equipment.

New lighting showroom opened in Washington

NATIONAL ELECTRIC Lighting has announced the opening of its new "Light For Living Center", showroom and office building, at 4406 Georgia Ave., N.W., in Washington, D. C.

David Leventhal, president of National Electric Wholesalers, of which National Electric Lighting is a division, stated that the more than 5000 square feet of display space in the new structure, will make it one of the largest lighting showrooms in the national capital area.

Offices of the firm are located on the second floor of the edifice. Stock room space is in the basement, and also at the rear of the second floor. A customer parking area adjoins the south side of the building.

The main showroom, on the first floor, is divided into several sections to display various types of items stocked by National Electric Lighting. In addition to a wide selection of ceiling fixtures, there are departments devoted to table and floor lamps, the new popular floor-to-ceiling, movable lamp poles, pull-down and pinup lamps, and kitchen and bathroom lighting fixtures. A large section is set apart for display of out-door garden, patio and porch lighting. Another features exhibits of electric clocks, and still another is a showing of fire place equipment.

The main showroom of the National Electric Lighting Center is divided into several sections to display various types of lighting fixtures. There are more than 5000 square feet of display space in the new structure.

Hollins speaks at press institute

A BREAKFAST for the Georgia Press Institute, held at the University of Georgia Center for Continuing Education recently, was sponsored by the Georgia Electric Membership Corp. The guest speaker at the breakfast was H. Redfern Hollins, Director of Market Research for ELECTRICAL SOUTH, who discussed advertising as it concerns members of the Georgia Press Association. This association includes the principal daily and weekly newspapers in the state. Mr. Hollins was introduced by John B. Davenport of the Georgia EMC.

McManus elevated to grade of Fellow

THE AMERICAN Institute of Electrical Engineers has announced the elevation of Clifford B. McManus, chairman of the board and director of the Southern Company and vice-president and director of the Georgia Power Company, to the grade of Fellow—the Institute's highest grade.

AIEE awards the grade of Fellow to members who have served with distinction in the electrical engineering profession. Mr. McManus was cited for "contributions to reinforcement and expansion of electric utility systems serving a large area."

FSU announces new engineering department

THE FLORIDA State University at Tallahassee announced recently the organization of a Department of Engineering Science with Dr. Grover L. Rogers as its first director. The program in engineering science will be the only engineering activity at the University.

The department will provide a single curriculum for students wishing to follow careers in research, development, and teaching. The curriculum will be heavily oriented towards mathematics, modern science, and the theoretical and experimental aspects of engineering. It is expected that most students will transfer to other engineering schools at the end of two years for conventional, specialized engineering programs.

Boatner named president of Wesco

B. H. BOATNER has been named president of the Westinghouse Electric Supply Co. He succeeds John F. Myers who is retiring after 37 years with Westinghouse.

Mr. Boatner has spent his entire business career with Westinghouse. Since May, 1957, he has served as

NEW
GUTH KOLORKODED* industrial fixtures with built-in

TRAFFIC LIGHTS

Designed to direct traffic, protect your workers, identify various plant or storage areas . . . and create new standards of seeing-efficiency for greater productivity.

They "wash away" ceiling shadows, yet assure high footcandles with comfortable shielding for the working level: 10% uplight with 13° cut-off or 25% uplight with 27° cut-off . . . for 430, 800 or 1500 M. A. operation. Easy installation and maintenance. Three reflector finishes—Permalux White, Porcelain or Alzak Aluminum.

WRITE FOR FREE KOLORKODED BULLETIN

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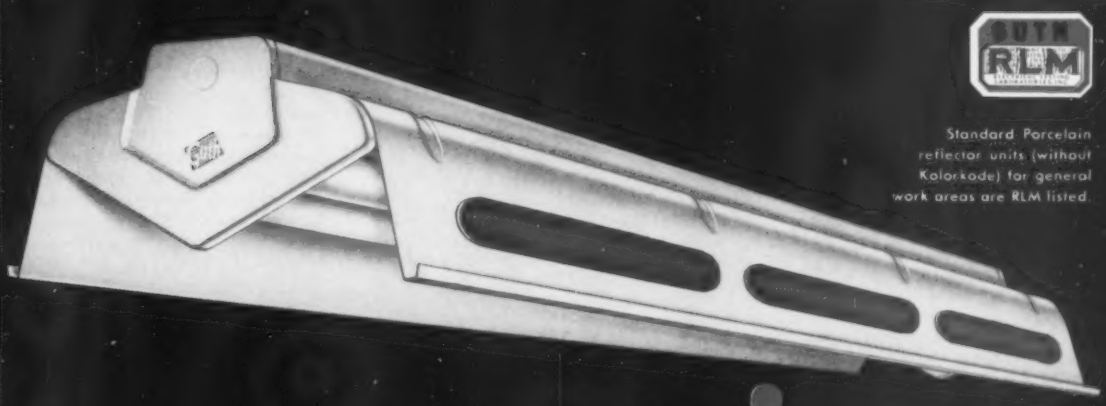


Standard Porcelain reflector units (without Kolorkode) for general work areas are RLM listed.

at exits, fire protection systems, keep-out areas, etc.

at stairs, curbs, dead ends and other hazard areas.

in aisles, safe storage, first-aid, etc.

Guth LIGHTING

THE EDWIN F. GUTH CO.
2615 Washington Blvd., St. Louis 3, Mo.
TRUSTED NAME IN LIGHTING SINCE 1902

vice-president and general manager of Wesco.

Mr. Myers went to work for Westinghouse in 1922 when its Philadelphia subsidiary, the H. C. Roberts Electric Supply Co. took over the wholesale end of a Washington, D.C., electrical firm where he was office manager.

Immediately designated branch manager, Mr. Myers retained his position after the organization of Westinghouse Electric Supply Co., later becoming manager for its middle Atlantic division with offices at Philadelphia. He rose steadily, subsequently becoming president of Wesco.

Scott to retire as G-E executive

LUTHER E. SCOTT has retired as vice-president, General Electric Co., at Dallas, Texas. He has been with the company for more than 35 years. Mr. Scott was recently honored by friends and business associates with a reception and dinner at the Statler Hilton Hotel. Out-of-town guests attending included friends from Atlanta, Memphis, Louisville, New Orleans, New York, and Houston.

New company formed in stock transaction

THE STOCK of the Miller Electric Construction Co., Atlanta, Ga., has been purchased from the parent company, Miller Electric Company of Florida, and will operate as T. D. McClure, Jr., Co., Inc.

The company, which will maintain the same address and personnel, will continue to operate throughout the Southeast as in the past.

Raybro appointments

RAYBRO ELECTRIC Supplies, Inc. has announced from company headquarters in Tampa, the appointment of Carlo Cobb as sales manager of its local Tampa branch, and the appointment of John H. Lipke, as merchandise sales supervisor to travel the state and work with the men of Raybro's seven branch offices. Both men will make Tampa their headquarters, Cobb with the local Tampa branch, and Lipke with Raybro's general office.

Kaiser publishes new price schedule

KAISER ALUMINUM and Chemical Sales, Inc. announced today it has published a price schedule for aluminum rigid conduit for electrical installations which will result in significant penetration of the market previously supplied almost entirely by steel.

The new per-foot, delivered price of Kaiser Aluminum conduit now averages only two to three per cent above steel conduit.

"This new pricing schedule makes aluminum conduit more economical than steel in virtually all types of electrical installations," states J. T. Dugall, general manager of the company's electrical conductor division. "Even at the former price, aluminum conduit was frequently less costly to install because it is one-third the weight of steel, bringing considerable savings in handling.

"Over 800 million pounds of steel conduit were sold in the nation last

TECHNICAL SALES MEETING—At a recent Atlanta technical sales meeting, sponsored jointly by Wide-Lite Corporation of Houston and L. Morris Landers Company of Atlanta, Howard W. Stentz, left, executive field engineer of Wide-Lite discussed industrial and commercial lighting equipment and trends. In the photo, left to right, are Mr. Stentz, L. Morris Landers, and Mayor Hartsfield of Atlanta. Wide-Lite distributors Graybar Electric and Thompson-Wilson of Atlanta also participated in the sales meeting.

SALES AWARD—B. Merritt, vice-president and director of sales for Mill-Power Supply Co., Charlotte 1, N. C., is shown here congratulating Archie W. Brown, Mill-Power representative in western North Carolina, and Howard Whitehead, inside salesman for Mill-Power, after they were awarded a "Victor" trophy by the Charlotte Sales Executives Club. This gold statuette symbolizes outstanding proficiency in salesmanship. Both men were cited for outstanding jobs during 1958. Left to right are Mr. Whitehead, Mr. Brown, and Mr. Merritt.

year with little competition from other materials due to price," Mr. Dugall continues. "With aluminum conduit priced equal to steel in several areas; and no greater than four per cent above elsewhere, it promises to open a major new market for aluminum."

NEW STYLE TRANSFORMER—R T & E Corporation President R. D. Nelson and Marketing Manager L. D. Barre inspect the first of the company's new style transformers being prepared for shipment. The new transformer, called the "Terra-Tran," designed for underground distribution, was introduced late last year to the industry.

Brief news notes of manufacturers

KAISER ALUMINUM and Chemical Corporation has announced that it plans to move its sales offices from Chicago to Oakland, Calif., within the next few months. The company plans to retain in Chicago its present regional and district sales headquarters, and to maintain an executive office there.

In order to continue to effectively serve the Midwestern and eastern markets some personnel whose activity is primarily concerned with technical and field service will also remain in Chicago.

* * *

ECONOMY FUSE and Manufacturing Co., Chicago, Ill., officially became part of Federal Pacific Electric Company's continent-wide sales and manufacturing organization as an exchange of stock agreement was formally closed recently. A pioneer electrical manufacturer, Economy

of the four major
brands of lamps
CHAMPION
stands out for
VALUE
VALUE THROUGH UNIFORMITY:
Uniformity in Champion lamps is guarded by over 200 inspections on the more than 3,000 different lamps available to satisfy the diversified lighting needs of factories, stores, homes, office buildings, streets, etc.
MORE THAN 200
CHAMPION LAMP INSPECTIONS
CHAMPION
Lamps
Incandescent
Fluorescent
CHAMPION LAMP WORKS
Lynn, Massachusetts
Your best buy in lamps

maintains, in addition to its headquarters plant in Chicago, factories at Palatine, Illinois, and Montreal, Canada.

* * *

BURNDY CORP., Norwalk, Conn., has contracted to acquire H. H. Buggie, Inc., Toledo, Ohio. Burndy, manufacturer of electrical connectors, thus broadens its line of connectors for the electronics market, currently manufactured and sold by its Omaton division.

It is planned that the acquisition, announced recently by Bern Dibner, Burndy president, will become effective on May 1st, 1959.

* * *

EJS LIGHTING Corporation has simultaneously moved both its Chicago and Philadelphia warehouses to new increased facilities in those cities. New addresses are Chicago, 2719 North California Ave. and Philadelphia, 309-11 Arch St.

* * *

IN A RECENT transaction, Southern States of Hampton, Ga., became the majority stockholder of Dominion Cutout Co., Ltd., of Toronto, Canada.

The announcement was made by W. C. Mitchell, executive vice-president of Southern States. Mr. Mitchell emphasized that both organizations

W. C. Mitchell

would continue to operate as usual, pointing out that the move was made to strengthen the long-established commercial and engineering ties existing between the two firms.

Management of the Canadian company will be under the deriction of W. C. Mitchell, president; Thomas McMillen, secretary-treasurer; N. H. Ferguson, sales manager; and Douglas C. Ferguson, factory manager.

Manufacturers' agent expands organization

SHANNON ASSOCIATES, manufacturers' representatives, Orlando, Fla., has announced the opening of a new office at 1512 N.W. 12th Terrace, Fort Lauderdale, Fla., which will serve a territory from Fort Pierce to Key West. Colin V. Dowds is in charge of the new office.

Shannon Associates represents Edwards Co., Norwalk, Conn.; Hoffman Engineering Co., Anoka, Minn.; and Electric Time Co., Natick, Mass.

40th Anniversary

L. W. GARDNER, Gardner Electric Co., Shelby, N. C., will soon celebrate the 40th anniversary of his being in the electrical contracting business. He is still operating the business in its original location in Shelby.

Sales manager named

ALEX MCLENNAN has been appointed sales manager, contract division of Thomas Industries, Inc., Louisville, Ky. The announcement was made by William L. Tierney, vice-president of contract sales for Thomas Industries.

Alabama distributors attend refresher course

A MOTOR refresher and training course for four distributors was held recently in Birmingham by Allis-Chalmers. Attending were representatives from Alabama Electric Co., Dothan; the Tuscaloosa Electric Supply Co., Tuscaloosa; and the Electrical Repair and Service Company and Mill and Textile Supply Co., Inc., both of Birmingham.

The meeting included a rewind demonstration in the shops of Electrical Repair and Service Company using "Silco-Flex" insulated coils. Duane W. Hertel, application engineer, Allis-Chalmers Norwood, (Ohio) Works, explained the technique.

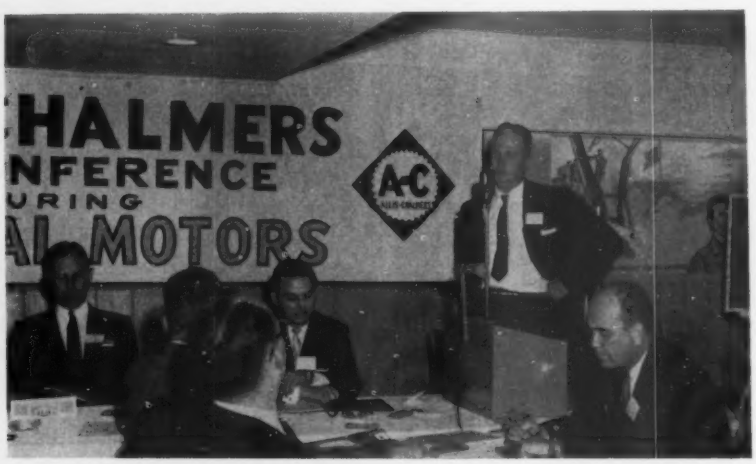
Other speakers included George H. Hoffman, manager, and William E. Watson, sales representative, Allis-Chalmers Birmingham district; E. T. Cuddeback, manager, general products division sales, Southeast region; and William D. Dineen, supervisor, distributor sales, electrical department, Norwood Works.

Edward C. Eaglen rejoins Oliver

EDWARD C. EAGLEN has rejoined Oliver Electrical Manufacturing Co., as Northeast Regional Sales Manager with headquarters in Pittsburgh. Mr. Eaglen came with Oliver originally in

E. C. Eaglen

1927 and therefore has a long engineering and developmental background in pole line hardware. He has participated in the development of many improvements in the field, among them static-proof hardware.



G. H. Hoffman, manager, Allis-Chalmers Birmingham district, addresses the distributors attending the motor refresher and training course held recently in Birmingham by Allis-Chalmers.

Balance . . .

what does it mean in cable?

No one characteristic alone determines good cable. It's the right balance of many qualities that counts. Carol *has* this balance. Look at these significant test results.

	BRAND			
	CAROL	A	B	C
Electrical Insulation Resistance (1)	100	17	16	68
Cold Bend °F (2)	−50	−45	−90	−50
Abrasion Resistance (1)	91	62	100	92
Ozone Resistance (1)	100	6	18	12

Note: (1) 100 indicates best—others % of best (2) cold bend—actual test temperature

As can be seen, needlessly high cold flexibility can be built into cable . . . but only at the sacrifice of more important electrical properties. And in Brands A, B and C you will also note the lack of balance between abrasion resistance and ozone resistance . . . which means these cables can crack long before they wear out.

Carol, on the other hand, has not only the highest *combined* rating but is also the best *balanced*. As a result of years of experience and research, primary emphasis has been placed on the characteristics most vital in cable life and performance.

To you, this means superior quality *throughout* . . . *extra* quality and performance where it is most needed.

when you call for cable— call for

Carol®

PORTABLE CORDS • POWER SUPPLY CABLE • CONTROL CABLES • WELDING CABLE • GOVERNMENT TYPES • CORD SETS

Men moving up in the industry

BRUCE C. HALSTED has been appointed manager of the Richmond district of Allis-Chalmers Industries Group succeeding J. M. Mathews, resigned.

Halsted, who had been a sales representative in the Richmond district since 1955, joined Allis-Chalmers in 1941. He was a sales representative in the Washington, D. C. office for five years prior to transferring to Richmond in 1946.

B. C. Halsted

Halsted left Allis-Chalmers in 1949 and rejoined the Richmond office in 1955.

* * *

B. H. SCHULTZ has been appointed manager of engineering, Kyle products. He succeeds R. C. Kirk, recently elected L-M vice-president for research and engineering. Since joining L-M, Schultz has held several engineering positions.

H. C. Stone has been promoted to chief engineer, capacitors and regulators. During his nine years with L-M, he has served principally as development engineer, capacitors.

* * *

A. R. WATSON, executive vice-president and general manager of the Southwestern Public Service Company, Amarillo, Texas, has been elected to the company's board of directors, and J. T. Bradley, who has been with the company for 32 years, has been named treasurer and assistant secretary, succeeding C. Willard Smith who retired as treasurer recently.

Watson has been Southwestern's executive vice-president and general manager since 1953, and had been a vice-president since 1947.

* * *

JULES P. GOLDSMITH, marketing manager, has been elected to the new office of vice-president-marketing of Royal Electric Corp., Pawtucket, R. I.

In 1951 Mr. Goldsmith took the position of advertising and sales promotion manager with Royal. He was promoted to marketing manager in 1957 and has directed the marketing and advertising activities of the company since that time.

* * *

H. GEORGE NAFE was recently appointed manager of the Century Electric Co., St. Louis, Mo., headquarters sales staff. Mr. Nafe will be in charge of all headquarter sales operations, and will report directly to R. N. Hill, vice-president of sales. Mr. Nafe has been with the company since 1941.

* * *

RICHARD D. OKERBERG has been promoted to chief engineer of electrical apparatus by Hubbard and Company. He will operate out of the new Hubbard electrical research and development laboratory in McCook,

Dates Ahead

American Institute of Electrical Engineers, Electric Heating Conference, Bellevue-Stratford Hotel, Philadelphia, Pa., April 14-15, 1959.

Missouri Valley Electric Association, Engineering Conference, President Hotel & Municipal Auditorium, Kansas City, Mo., April 15-17, 1959.

International Association of Electrical Inspectors, Alabama Chapter, Jefferson Davis Hotel, Montgomery, Ala., April 16-17, 1959.

Southeastern Electric Exchange, Engineering and Operation Section Meeting, Belleview Biltmore Hotel, Belleair, Fla., April 16-17, 1959.

Illuminating Engineering Society, South Central and Southeastern Joint Meeting, Grove Park Inn, Asheville, N. C., April 23-24, 1959.

Edison Electric Institute, Meter and Service Committee Meeting, Chase Hotel, St. Louis, Mo., April 27-29, 1959.

National Electrical Contractors Association, Southeastern District, Grove Park Inn, Asheville, N. C., May, 1959 (Dates to be announced).

Illuminating Engineering Society, Southwestern Section, Shamrock-Hilton Hotel, Houston, Texas, May 4-5, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, The Shoreham, Washington, D. C., May 7-8, 1959.

International Association of Electrical Inspectors, Florida Chapter, Sarasota Terrace Hotel, Sarasota, Fla., May 8-9, 1959.

International Association of Electrical Inspectors, Five Chapter Joint Meeting (George Welman, Baton Rouge, North-Louisiana-East Texas, Texas, and Texas Gulf Coast Chapters), Carlton Hotel, Tyler, Texas, May 15-16, 1959.

American Institute of Electrical Engineers, Middle Eastern District Meeting, Lord Baltimore Hotel, Baltimore, Md., May 19-21, 1959.

National Association of Electrical Distributors, 51st Annual Convention, Conrad Hilton Hotel, Chicago, Ill., May 24-27, 1959.

American Institute of Electrical Engineers, Summer and Pacific General Meeting, Seattle, Wash., June 22-26, 1959.

Illuminating Engineering Society, National Technical Conference, Mark Hopkins Hotel, San Francisco, Calif., Sept. 7-11, 1959.

Edison Electric Institute, Meter and Service Committee Meeting, Wentworth - by - the - Sea, Portsmouth, N. H., Sept. 14-16, 1959.

Public Utilities Association of the Virginias, Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Sept. 17-20, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, Rice Hotel, Houston, Texas, Oct. 1-2, 1959.

International Association of Electrical Inspectors, Southern Section, 31st Annual Meeting, Heidelberg Hotel, Jackson, Miss., Oct. 12-14, 1959.

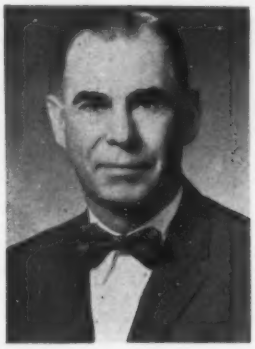
American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill., Oct. 12-16, 1959.

Ill. Prior to this appointment Okerberg was chief engineer on another phase of Hubbard development.

* * *

THE APPOINTMENTS of C. B. Peck, Jr., and John L. Tindale as commercial vice-presidents of the Anaconda Wire and Cable Company were announced recently.

Mr. Peck joined the Anaconda Wire and Cable Company sales or-



C. B. Peck

J. L. Tindale

ganization in 1936. In 1954, he was appointed manager of industrial sales, a position he has held until now.

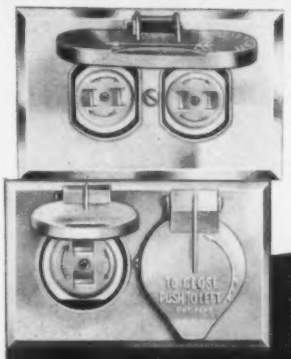
Mr. Tindale also joined the company's sales organization in 1936. He was transferred to New York headquarters as manager of utility sales in 1952.

* * *

HOLAN CORPORATION announces the appointment of Herman J. Troche to vice-president and consultant. He was formerly vice-president-engineering. George H. Eckels, formerly vice-president and general manager, Holan Corporation of Georgia, will replace Troche as vice president-engineering.

Three new appointments have been announced by Holan Corporation of Georgia. Robert R. Rector, formerly vice-president-sales will become vice-president and general manager. O. H. Stelter, Jr., has been appointed vice-president-engineering and manufac-

AT LAST! TRULY WEATHERPROOF



SELF CLOSING COVERS

SELF CLOSING OUTLETS

BELL NO-SHOK

Weathertight RECEPTACLE with Waterproof SAF-T-LOK COVER

CHECK THESE EXCLUSIVE FEATURES:

PATENTED NO-SHOK SELF-CLOSING OUTLET

- Prevents insertion of metal objects into current-carrying parts; prevents shocks, burns, short circuits.
- Snaps shut when plug is removed.
- Keeps out dirt, rain, snow — better electrical contact.

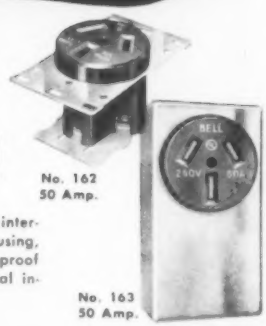
SAF-T-LOK WEATHERPROOF COVER

- Locks in open position
- Closes with slight finger pressure
- Can't be loosened or pulled off

NEW DE LUXE RANGE and DRYER POWER OUTLETS

30 and 50 AMP. Grounding Type

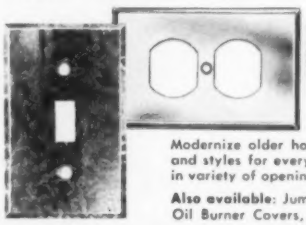
NEWEST DESIGN in FLUSH MOUNTING type features sliding back plate for easy, fast wiring. Newly designed terminal contacts and break-off type yoke, for use with all types (including FS) boxes.



No. 162 50 Amp.

LATEST SURFACE MOUNTING type features removable, interchangeable (30 or 50 Amp.) receptacle. Heavy-duty metal housing, opens easily for fast wiring. Snaps closed with pressure. Shock-proof housing prevents breakage, for use in residential and industrial installations. Available in white baked enamel or aluminum. (Special colors on request.)

No. 163 50 Amp.



...and De Luxe METAL WALL PLATES in sales-building new finishes

Modernize older homes, beautify new ones, traditional or modern. Sizes and styles for every need — in choice of 14 finishes — from 1 to 10 gang, in variety of openings.

Also available: Jumbo Plates, 1- and 2-gang Louvered Plates, 1- to 5-gang Oil Burner Covers, Engraved Plates, etc.

Make BELL your one source for the best in Weather-proof, the largest line available in 1, 2 or 3-gang outlets, switches or covers. Also No-Shok devices and Metal Wall Plates. *Write for Catalog and Prices today!*

BELL ELECTRIC CO.

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when you come to
GRIPS
choose FANNER
Superformed*
FANNGRIPS*
For the GRIP — a FF FANNGRIP encircles a strand so tightly that it almost becomes a part of the strand.
Because the frictional force is greater than the strand strength, FANNGRIPS cannot slip!
For the SIMPLICITY — FF FANNGRIPS are easily and quickly applied by hand.
FANNGRIPS apply in a minimum of time without tools — eliminate laborous field fabrication.
For the COST — FF FANNGRIPS cost less, yet provide so much more than ordinary gripping methods.
No other dead-ending method matches the overall economy of FANNGRIPS.
FANNGRIPS FOR GUY STRANDS
Available for all galvanized steel, Copperweld and Aluminum Strands
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FF PLASTIC FANNGUARDS — MOLDINGS & TUBINGS
Fine FANNER
Superformed Products
THE FANNER MANUFACTURING CO.
BROOKSIDE PARK CLEVELAND 9, OHIO
Electrical Products Division

turing. Stelter was formerly assistant sales manager. Clifford M. Booker, who has been assistant secretary and treasurer will become secretary and treasurer. George H. Eckels will continue as chairman of the operating committee for Holan Corporation of Georgia.

* * *

W. E. HENGES, president of the Graybar Electric Co., Inc., has announced the appointment of W. B. Whaley as midwestern district manager at Kansas City.

Mr. Whaley joined Graybar as a student at the warehouse in Richmond in 1936. The following year he was appointed to the credit department. In 1949 he was promoted to district credit manager at Jacksonville, Fla. In 1952 he was made district financial manager at Kansas City, and in 1957 he became assistant district manager, which position he has held until his present appointment.

* * *

ERNEST W. SCHAW and Fitz L. Sargeant of Reynolds Metals Co., general managers of the southeastern and south central sales regions respectively, have been elected vice-presidents of Reynolds Aluminum Sales Co.

Mr. Schaw joined Reynolds in 1935. He has held the position of managing the company's sales in the southeastern region with headquarters in Camden, N. J., since 1951.

Mr. Sargeant joined the company in 1941. In 1952 he was promoted to his present position in charge of sales for the southeastern region with headquarters in St. Louis, Mo.

* * *

BRUCE R. SIMMONS has been appointed sales manager for the H. B. Sherman Manufacturing Company of Battle Creek, Mich. Mr. Simmons joined the Sherman company as Indianapolis sales representative in 1945. He was named assistant sales manager in 1949.

* * *

BERTRAND J. FARRELL has been appointed general sales manager of the Jefferson Electric Co., Bellwood, Ill., according to E. J. Bennan, company president. As general sales manager, Mr. Farrell will be in over-all charge of the Consumer and Industrial Sales Divisions of Jefferson.

Manufacturers appoint new representatives

JULES J. DREYFUSS' Sons has been appointed sales agent for Chester Cable Corp., manufacturers of building cables and all specialty wires. Their representation will include the states served by Dreyfuss offices in Miami, New Orleans, and Atlanta.

PUT FULL HOUSEPOWER TO WORK

Fast Recovery For Faster Selling, Greater Loads

Water heaters, with an average annual load factor of 47% and an average annual usage of 3600 KWHR, build loads and profits better than any other household appliance. And, to help you add more of this important business to your lines, Hotpoint offers 40-gallon round and table-top models with the fast recovery today's consumer demands. They provide 470 gallons of hot water every 24 hours—more than 6 times the average family's daily requirements. And, they save space and money by eliminating large storage tanks. Display and promote Hotpoint fast-recovery water heaters for greater earnings.

Model WBA42-1

15-YEAR WRITTEN PROTECTION PLAN ON DELUXE MODELS

One-year warranty on the complete heater, and an additional 7-year replacement warranty on the tank, plus an additional 7-year tank exchange plan. 10-year written protection plan on "Silver Line" Models.

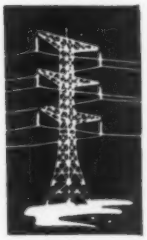
Additional Hotpoint features your customers will want:

LIVE BETTER ELECTRICALLY

MIRACLE MLC-7 ADDITIVE fights rust and corrosion, can lengthen tank life as much as 200%, depending on condition of water.

GENUINE CALROD® MAGIC CIRCLE® HEAT—the most widely used heating units in the world. Famous for efficiency and long life.

PROVEN LEADERSHIP—over ⅓ of all electric water heaters have been made by Hotpoint, and less than 1% have ever needed service.



LOOK FOR THAT **Hotpoint** DIFFERENCE

A Division of General Electric Company, Chicago 44, Illinois

In order to keep a complete stock to give better service, stock is carried only in the Atlanta warehouse from which point shipments are made the same day the order is received via a direct carrier.

* * *

GORDON WELLS, general sales manager of Day-Brite Lighting, Inc., St. Louis, Mo., announces the appointment of M. Breeden Moore, Jr., Myrtle Beach, S. C., as sales representative for the company in the South Carolina territory.

M. B. Moore, Jr.

JAMES A. ROBBINS, sales engineer, will be serving an expanded Southeast territory for White Diesel Engine Div., it was announced recently. W. F. Burrows, vice-president and general manager, stated that Mr. Robbins' appointment extended direct factory representation to all of Florida, Georgia, and the Carolinas for White Diesel Engine Div., The White Motor Co.

* * *

W. J. CHILDERS of Dallas, and his associate, Robert A. Putterman of Houston, have been appointed sales representatives for the state of Texas, except for the El Paso area and a small segment of northeast Texas, by the Kirlin Co., Detroit, Mich.

* * *

JAMES BAXTER, sales manager of Cornish Wire Co., manufacturers of cord sets and wire products, announces the appointment of Paul Lumpkin Co., Builders Bldg., Charlotte, N. C., to represent the firm in North and South Carolina. Warehouse stocks are in Charlotte.

* * *

WILSON BYRD has been named representative for Tork Time Controls, Inc., in North and South Carolina. Residing in Greensboro, N. C., Mr. Byrd will establish "home base" offices for the territory in that city.

* * *

ANDERSON Electric Corp., Birmingham, Ala., has announced the appointment of Gaddis G. Hall as their factory sales representative for South Georgia and Florida. Mr. Hall's headquarters will be in Miami.

* * *

FEEDRAIL CORP., New York, announces the appointment of Bill Crichton and Associates, Riverview, Fla., as its sales representative in the State of Florida, east of but not including the counties of Jackson, Calhoun, and Gulf.

* * *

THE EDWIN F. GUTH Company has annnounced the appointment of Jones-Philibert and Company, Inc., manufacturers representatives, as their new lighting sales agents for the Louisiana, Mississippi, and western Tennessee area.

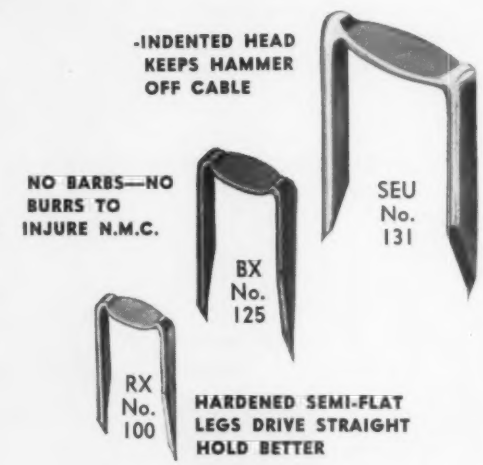
* * *

TWO ADDITIONAL sales representatives of Day-Brite Lighting, Inc., were recently appointed. J. N. Crevasse announced the addition of Ger-

HEAVY DUTY "SNAPER" STRAPS
FOR THIN WALL & RIGID CONDUIT

VIKING

The "NOB"ILITY of STAPLES


-INDENTED HEAD KEEPS HAMMER OFF CABLE
NO BARBS—NO BURRS TO INJURE N.M.C.
SEU No. 131
BX No. 125
RX No. 100
HARDENED SEMI-FLAT LEGS DRIVE STRAIGHT HOLD BETTER

There is a difference—Why take less!

W. W. CROSS & CO. — JAFFREY, N. H.
General Sales Agent
J. J. WALSH COMPANY
FASTENERS SINCE 1869
Greenville, R. I.

ald E. (Jerry) Plocar to Day-Brite agents, J. N. Crevasse and Associates, Jacksonville, Fla. Frank E. Brown, Connecticut and western Massachu-

G. E. Polcar

C. E. Johannsen

setts representative of Day-Brite, announced that Court E. Johannsen will be associated with him in his territory. Johannsen's headquarters will be in New Haven, Conn.

Helpful literature

Allis-Chalmers, Milwaukee 1, Wis., announces the release of a new bulletin describing their **mobile substations** in ratings through 10,000 kva, 69 kv and below. Equipped with transformer, high voltage switch, lightning arresters, fuses, and low voltage switchgear, the substations are designed for emergency service, abnormal loads, as continuity equipment, or as a temporary substation. The units are available with two or three high voltages connectable either delta or wye.
Write B-416 on reply card, page 19.

A full-color catalog folder showing their entire line of **electrical insulating tapes** has just been issued by **Plymouth Rubber Co., Inc.,** Canton, Mass., manufacturers of slipknot friction and plastic tapes.

From regulator to lamp

. . . use cost-saving

SUPERIOR CABLES

Thermoplastic Series Lighting Cables

- High resistance to earth acids and alkalis
- High resistance to sunlight, moisture, weather
- Small diameter, lightweight
- Easy to splice

Figure 8 Pole & Bracket Cable

- High resistance to abrasion, mechanical damage
- Does not deteriorate with age or weather
- Will not support combustion
- Flexible, strips clean, speeds installation

Performance and economy go hand in hand with SUPERIOR plastic insulated and jacketed cables.

All SUPERIOR CABLES are quality-engineered, precision manufactured and thoroughly tested.

From regulator to lamp . . . for low initial cost . . . for less maintenance cost . . . order SUPERIOR CABLES!

For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

3869

Give Your Customers MORE + VALUE at Lower Cost!

with ARROW-HART

"ADD-ON" 100 Amp Service Equipment

When you install Arrow-Hart 100 Amp "ADD-ON" Service Equipment you provide for your customer's *future* electrical needs, because you can easily add 2 or 4 fused branch circuits to the Small 8-Circuit Enclosure . . . and add 2 to 8 fused branch circuits to the Large 12-Circuit Enclosure. *Contractors tell us that — once this "ADD-ON" feature is explained to a customer — it means a sure sale.* Equally important, you can offer your customers this extra value for less money, because these Arrow-Hart units are priced lower than circuit-breaker equipment . . . and because they're the *only* fused-type units that provide the "ADD-ON" feature at no extra cost. Get all the facts. Send now for your free copy of fully descriptive Folder No. A-228 . . . or see your Authorized Arrow-Hart Distributor.

Dept. ES — The Arrow-Hart & Hegeman Electric Co. 103 Hawthorn St., Hartford 6, Conn.

Have you tried the new Arrow-Hart Quiette Tap Action Switches?

ARROW AH HART

Quality since 1890

MOTOR CONTROLS · ENCLOSED SWITCHES
APPLIANCE SWITCHES · WIRING DEVICES

ARROW AH HART

The new catalog combines full color photographs of every package in the line complete with descriptions, and sizes and packing information, all within a 6-page, heavy coated stock folder, punched for distributors' counter reference books and for their salesmen. Included also in this folder are complete specification data charts for all Plymouth friction tapes, splicing compounds and plastic tapes.
Write B-417 on reply card, page 19.

The new 1959 four-color catalog just issued by **Moe Light Div.,** Thomas Industries, Inc., 410 S. Third St., Louisville, Ky., contains information on their entire line of **lighting fixtures.** Among the time-saving features of the catalog is a fixture index on the inside flap of the front cover and a fixture selection guide on the inside flap of the back cover.
Write B-418 on reply card, page 19.

Bulletin CR1B, describing the Kyle Type E **oil circuit recloser,** is now available from **Line Material Industries,** Milwaukee 1, Wis. The bulletin was recently revised to describe latest improvements in the Type E recloser. In addition to application, operation, and dimensional information, increased ratings of this 150-kv BIL recloser are shown.
Write B-419 on reply card, page 19.

"The Busway Story" is the title of a film now available through the Busway Section of the **National Electrical Manufacturers Association,** 155 East 44th St., New York 17, N. Y. The fifteen minute presentation is available for showing to all interested groups, including electrical contractors, electrical maintenance engineers, general contractors, architects, owners and managers of commercial and industrial buildings, and Chambers of Commerce.
Write B-420 on reply card, page 19.

A four-page illustrated folder describing the Jetapower line of **electric plants** is available from the manufacturer, **Jetapower Power Equipment Division,** Jeta Metal Fabricators, Inc., 957 Saw Mill River Road, Yonkers 2, New York. These units, available for gasoline, gas, or diesel operation, from small air-cooled units up to 300 kw, are suited to a wide range of applications, for standby or constant use.
Write B-421 on reply card, page 19.

A new 8-page catalog on its complete line of **tong test a-c—d-c ammeters** has just been released by **Columbia Electric Mfg. Co.,** 4519 Hamilton Ave., Cleveland 14, Ohio. The new bulletin pictorially illustrates eight types of instruments and gives detailed information on the selection, ordering, and use of tong test ammeters, clamp-type ammeters that measure both a-c and d-c. There are actual size scale ranges shown to

assist in the specification of desired ranges. Special tong tests for low current readings are also pictured and described.
Write B-422 on reply card, page 19.

Three new **ceiling systems** recently introduced by **Smithcraft Lighting,** Chelsea, Mass., are fully described in literature now available.

The new literature gives complete information on Smithcraft area illumination, Smithcraft large element lighting, and Smithcraft overall illumination. Colorful, 6-page folders on each of the lighting systems enables the reader to become familiar with the systems in a few moments.
Write B-423 on reply card, page 19.

Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill., has reissued their 20-page technical bulletin on their "V-51" Series convertible, **vaportight lighting fixtures.** Complete description and dimensional data on all parts and accessories are contained in the bulletin.
Write B-424 on reply card, page 19.

Arrow-Hart and Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn., has made available their new Motor Controls Catalog #14. The new 80-page, illustrated catalog gives complete size, weight, and ratings information. It is arranged to provide quick easy reference to the manufacturer's complete line of **motor controls** and accessories.
Write B-425 on reply card, page 19.

New Floodlight Catalog 320 is now available from **Crouse-Hinds Co.,** Syracuse 1, N. Y. The catalog is designed so that the reader can easily select from it the proper floodlight for a job. New listings and prices on the complete Crouse-Hinds **floodlight line** are included in this catalog.
Write B-426 on reply card, page 19.

Pocket Federalog 111-PR, a handy pocket-sized catalog giving **pricing data** on all products available from distributor stocks, has been issued by **Federal Pacific Electric Co.,** Dept. 303, 50 Paris St., Newark 1, N. J. Included in the Pocket Federalog is a Stab-lok Enclosure Selector, which provides a quick, accurate method for selecting proper enclosure for a particular job.
Write B-427 on reply card, page 19.

Charles Machine Works, Inc., P. O. Box 66, Perry, Okla., has announced the availability of a new bulletin describing their **trenching tool,** Ditch Witch. The bulletin contains information on applications, construction, and specifications.
Write B-428 on reply card, page 19.

Complete and accurate information for proper installation of a new, primary overhead insulated **distribution system** (5-15 kv) is spelled out in a 20-page technical bulletin re-

ASK YOURSELF THIS IMPORTANT QUESTION!

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Check over the list of publications available, circle the numbers of the ones you need, and mail the coupon on page 19 to us with your name, title, company and address plainly written. We will tell each manufacturer to send directly to you the information you want.

The staff of ELECTRICAL SOUTH will be glad to help you with other problems. They will obtain expert advice for you on both technical and business problems. The services of a number of consultants are available. Whether your problem relates to sales promotion, lighting or wiring layouts, applications of the National Electric Code, or equipment application, it will receive careful attention.

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Reader Service

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806 Peachtree St., N. E.
Atlanta 8, Georgia

cently issued by **Rome Cable Corp.**, Rome, N. Y.
Write B-429 on reply card, page 19.

Latest and most complete information available on the **soldering of aluminum** is presented in a new booklet by **Reynolds Metals Co.**, Dept. PRD-6, Box 2346, Richmond 18, Va. Types and properties of aluminum solders are explained, plus the corrosion of soldered joints and their performance in aluminum.
Write B-430 on reply card, page 19.

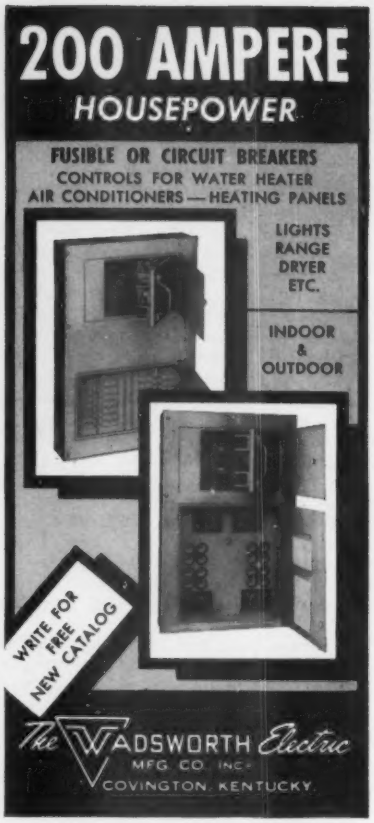
A new four-page catalog in two colors illustrating their new series of **Gym Lites** is available from **All-Brite Fluorescent Fixtures, Inc.**, 352 Shaw Rd., South San Francisco, Calif. All Gym Lites are basically of the industrial design. Mesh guards drop on hinges from either side for easy service—yet they cannot be accidentally dislodged.
Write B-431 on reply card, page 19.

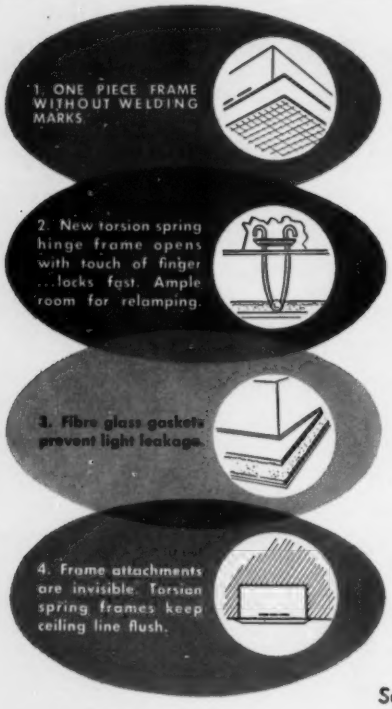
Bulletin CR1CA, describing the complete line of **recloser accessories** for Kyle Type R and W reclosers, is now available from **Line Material Industries**, Milwaukee 1, Wis. Included is information about ground-trip solenoid, shunt-blocking, shunt-closing, shunt-lockout, and shunt-trip solenoids, in addition to a description of five current transformers. Stud-type terminals, mounting frames, current metering, and other accessories are also shown.
Write B-432 on reply card, page 19.

Kuhlman Electric Co., Birmingham, Mich., has published a new bulletin on Kuhlman **substation transformers.** It covers single and three phase transformers up to and including 10,000 kva, through 69 kv. The illustrated bulletin details construction features, standard accessories, and optional accessories of the units.
Write B-433 on reply card, page 19.

A new four-page, two-color bulletin available from **General Electric**, Schenectady 5, N. Y., outlines benefits of **better lighting** in rural or suburban areas with automatically controlled mercury-vapor lighting. New General Electric twist-lock photoelectric control is featured along with mercury luminaires.
Write B-434 on reply card, page 19.

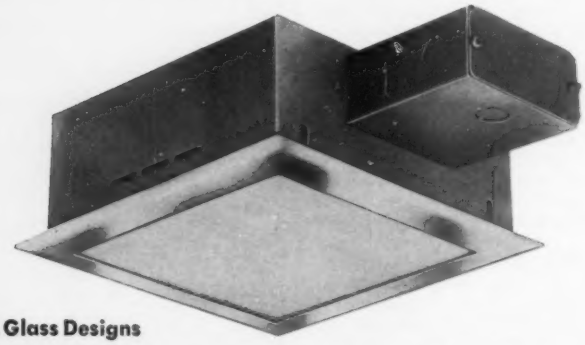
A new eight-page **General Product** Bulletin has been published by Roller-Smith, Inc., a subsidiary of **Federal Pacific Electric Co.**, 50 Paris St., Newark 1, N. J. Covered in the two-color catalog are Roller-Smith's lines of indicating instruments, distribution and control equipment.
Write B-435 on reply card, page 19.




1. ONE PIECE FRAME WITHOUT WELDING MARKS.
2. New torsion spring hinge frame opens with touch of finger ...locks fast. Ample room for relamping.
3. Fibre glass gaskets prevent light leakage.
4. Frame attachments are invisible. Torsion spring frames keep ceiling line flush.

advanced recessed lighting by ATLITE

Superior lighting design and construction plus low cost make Atlite the value line in recessed fixtures.



Six Glass Designs

Seven Finishes — Chrome... Copper... Brass... White... Grey
Satin Aluminum Anodized... Satin Black Anodized

Send for NEW ILLUSTRATED CATALOG of the complete ATLITE line.

Atlite "The Line With Light Appeal"

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Lighting handbook

"I.E.S. Lighting Handbook." Published by the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y., 1100 pages, $10.00.

A completely new 1100-page Third Edition of the well-known I.E.S. Lighting Handbook, to be published in March 1959, has been announced by the Illuminating Engineering Society, international lighting organization.

The new Third Edition of the Handbook brings up-to-date the many new and dynamic developments in lighting since 1952 when the Second Edition was published. All sections have been completely restudied and revised by over 700 I.E.S. members of 34 Technical Committees. New sections have been added in order to gather all pertinent information under specific subject headings. For instance, the section formerly headed "Interior Lighting" is now broken down into several sections, such as: "Offices and Schools"; "Institutions and Public Buildings", "Residential," etc.

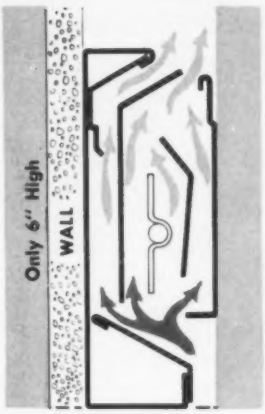
New illustrations throughout the lighting application sections of the new Third Edition of the I.E.S. Lighting Handbook, and new charts, graphs and tables, the editors say will increase the value of the Handbook for quick and easy reference use both in the office and field.

Of particular importance in the Third Edition of the I.E.S. Lighting Handbook will be the new tables of higher recommended lighting levels for almost every conceivable lighting task. These levels will be published in full for the first time anywhere in the new Handbook. Based upon the now-famous Blackwell researches, conducted under the auspices of the Illuminating Engineering Research Institute, these new tables recommend greatly increased footcandle requirements for many lighting areas. For many months, I.E.S. Technical Committees have been evaluating and correlating Dr. Blackwell's findings with their particular fields of lighting, with results far more scientifically determined than any in the past.

Sections of the new Third Edition, I.E.S. Lighting Handbook, fall into three major categories beginning with basic reference information such as those headed "Physics of Light", "Light and Vision", "Color", "Daylighting", etc. Following are sections covering "Lighting Calculations", "Interior Lighting Design", etc. Other sections deal entirely with lighting applications. There are 25 section headings in the text pages, each reference thoroughly indexed

NEW

Cavalier improved
BASEBOARD
with FULLY ENCLOSED ELEMENT



Vertical fin welded continuously to element sheath helps radiate heat, does not obstruct air flow. Construction eliminates dust traps. Heated air is thrust out into room, away from walls.

Now, the heating element in Cavalier Baseboard is fully enclosed in tubular steel sheath—same type proved so reliable and long-lived on electric ranges. Yet the maximum surface temperature never exceeds 125°F.—a Cavalier exclusive feature that's an extra buying reason for those with children. Heating output is full 200 watts per lineal foot.

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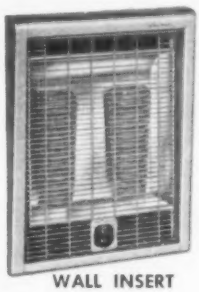

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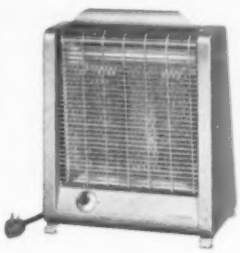

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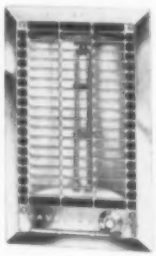
2, 3, 4 KW



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and cross-indexed in the voluminous index pages at the back of the book. Included as well is a Manufacturers' Reference Data section and Lighting Equipment Directory pages which will feature the lighting fixtures, accessories and materials of leading manufacturers serving the lighting field.

The Third Edition, I.E.S. Lighting Handbook, as have previous editions, has been expressly designed and prepared for field use and office reference of lighting engineers and specialists; architects; consulting engineers; electrical distributors and contractors; lighting equipment manufacturers; in fact, anyone professionally concerned with lighting in any way, as well as for use as a textbook and library reference for colleges, professors and students of lighting. Vital statistics are as follows: publication date, March 1959; binding, durable dark-green Fabrikoid, richly imprinted in white; size, 1100 pages; weight, five pounds; price, after special prepublication offer and upon publication in March 1959, $10 per copy. Details may be obtained from Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Energy conversion

"Electromechanical Energy Conversion," by David C. White and Herbert H. Woodson. Published by John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 646 pages, $12.50.

Writing in terms of current engineering applications, where the dynamic behavior of devices and systems assumes prime importance, David C. White and Herbert H. Woodson have prepared their "Electromechanical Energy Conversion." The new book is the second volume in the M. I. T. "core curriculum" program in electrical engineering.

White and Woodson start from the fundamentals of analytical dynamics, using them to analyze typical energy converters. The essential concepts of electromechanical energy conversion are illustrated by the analysis of several simple transducers. Recognizing the importance of dynamic behavior in system design, the authors discard excess detail about steady-state characteristics and device design. They favor, instead, a thorough treatment of dynamic characteristics of energy converters, feedback control system theory, and their interrelations.

To illustrate and utilize the unity that exists in the analysis of machines, the authors develop a two-phase model of an electric machine, classified as the generalized machine. Its equation of motion is derived and used in all the machine analyses of later chapters. The technique of ap-

plying constraints to general dynamic equations is used in a detailed discussion of the dynamics of commutator machines, induction machines, and synchronous machines.

Drs. White and Woodson are both in the electrical engineering department of the Massachusetts Institute of Technology. For laboratory use in conjunction with the book, they have designed a generalized machine that provides additional insight into theory and operation.

Tape recorders

"Tape Recorder Manual, Volume 3." Published by Howard W. Sams and Co., 2201 E. 46th St., Indianapolis 6, Ind., 160 pages, illustrated, $2.95.

Tape Recorder Manual, Volume 3, contains a new editorial section complete with illustrations describing the various types of tape transport mechanisms and how they work.

This is followed by a complete Photofact service data coverage on 22 models of 1957-58 recorders.

Brand-name tape recorders covered in this latest manual are: Ampex, Geloso, Knight, Magnecord, RCA Victor, Revere, Silvertone, Webcor, Wilcox-Gay, and Wollensak.

Data on each model includes authoritative information such as: general operation data, use of external speakers, mechanical and amplifier adjustments, cleaning, lubrication, etc. For each recorder covered, there is complete information on troubles and probable remedies, plus a complete mechanical, electrical parts list and exclusive "exploded view." A handy cumulative index lists tape recorder coverage in all three volumes.

Oscilloscope

"101 Ways to Use Your Oscilloscope," by Robert Middleton. Published by Howard W. Sams and Co., 2201 E. 46th St., Indianapolis 6, Ind., 180 pages, $2.50.

This practical new book covers the many possible uses of the oscilloscope. A total of 109 special notes supplement the 101 uses described. Complete information specifies equipment needed, connections required, proper procedure, and methods for the evaluation of results. A total of over 400 illustrations of waveforms and test setups are also included.

The basic 101 checks and tests fully describe equipment checks, antenna tests, RF and IF tests, video amplifier tests, sync circuit tests, chroma circuit tests, convergence circuit tests, intercarrier sound tests, audio amplifier tests, and miscellaneous tests.

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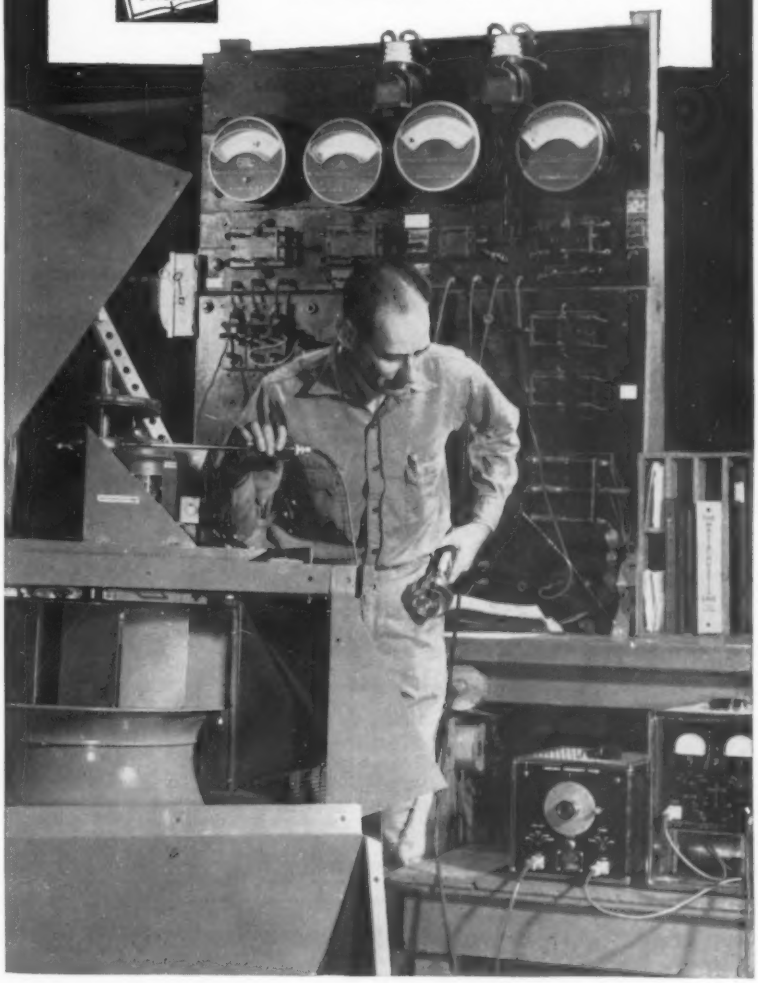

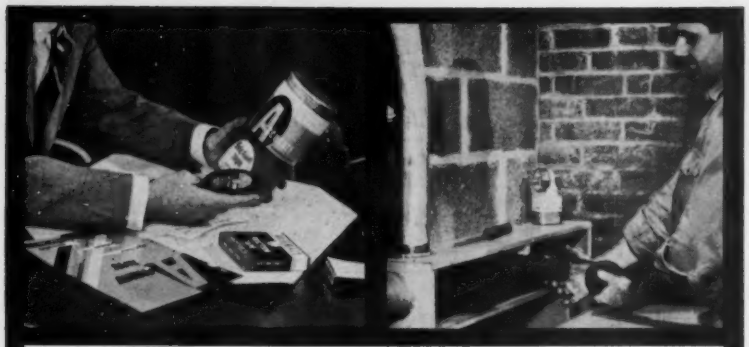

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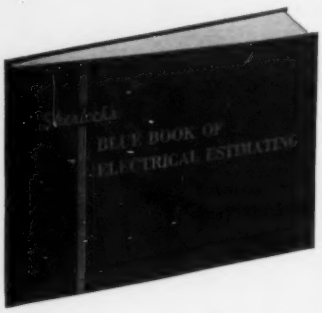

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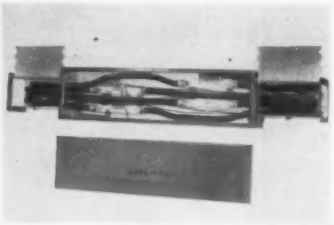
(April 1959)

New products

Circuit connection cabinets feature easier wiring

A NEW TYPE of branch circuit connection cabinet, designed for use as an integral part of standard wireway runs is now offered by Keystone Manufacturing Co., 23328 Sherwood



Rd., Warren, Mich., manufacturers of wiring installation equipment.

Called Keystone "Safe-T-Taps," the new cabinets feature several advantages, such as faster, easier wiring by eliminating the troublesome job of pulling heavy conductors through long wireway runs. Instead, they permit the use of short, easy-to-handle lengths which may be quickly connected to the "Safe-T-Tap" bus-bars. Another important feature is the increased flexibility of the cabinets, since many branch circuit connections can be tapped into main power lines by means of special solderless connectors in an area of less than three feet.

Write P-440 on reply card, page 19.

Dry-type transformers smaller, quieter, lighter

A COMPLETELY NEW line of general purpose dry-type transformers, up to 50 per cent smaller, 35 per cent

lighter, and 15 decibels quieter than previous models, has been introduced by General Electric's Specialty

Transformer Dept., Schenectady 5, N. Y., for supplying lighting and power loads from electrical systems to commercial and industrial applications.

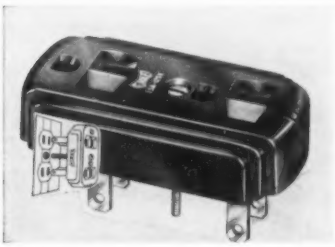
Rated 600 volts and below at 25 va to 167 kva, single-phase, and 3 to 500 kva, three-phase, the new Hi-Q (High Temperature-Quiet) transformers are available in three types. Designated B, F, and H, each is designed with a newly developed silicone impregnated insulation system to provide, according to company engineers, a desirable combination of electrical and physical characteristics in transformers used for stepping down secondary distribution system voltage.

Write P-441 on reply card, page 19.

Tap converts receptacles to safe grounded outlets

OLD RECEPTACLES can be converted to safe grounded outlets to take the grounded caps of the latest electric appliances without rewiring using a double ground tap introduced by Eagle Electric Mfg. Co., Inc., 27-10 Bridge Plaza South, Long Island City, N. Y. (This assumes, of course, that existing convenience outlet is installed in a grounded metal box.)

To attach the double ground tap, wall plate screw is removed, the ground tap is inserted into present



receptacle and permanently connected with its own screw.

The #880, rated 15 amps, 125 volts, has no ground wires to attach or work loose, and double polarized prongs and polarized self-finding slots retain polarization of receptacle. The center fastening screw of the tap grounds the device as well as the wall plate to the receptacle.

Write P-442 on reply card, page 19.

Fluorescent lamp ballast smaller and lighter

REPLACING ballasts supplied in twin containers as ballast and auxiliary, Advance Transformer Co., 2950 North Western Ave., Chicago 18, Ill., has brought out a smaller and lighter fluorescent lamp ballast in a single container for two 96-inch or two 72-inch SHO, VHO, or Powergroove lamps.

A lower watt loss gives user a bonus reportedly equivalent to an increase in over-all efficiency of eight lumens per watt.

Write P-443 on reply card, page 19.

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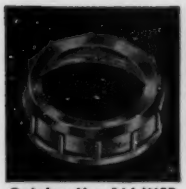
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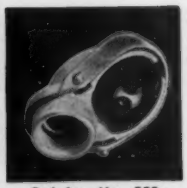
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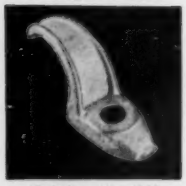
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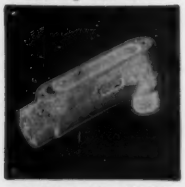
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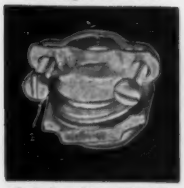
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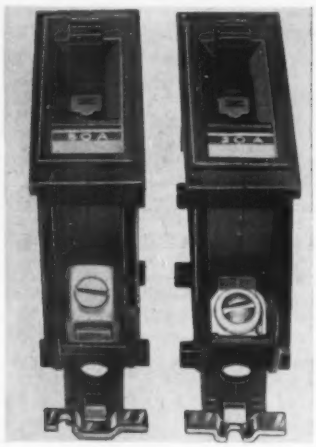
Circuit breakers are non-interchangeable

A NON-INTERCHANGEABLE circuit breaker has been introduced by the Wadsworth Electric Manufacturing Co., Inc., Covington, Ky. Such a breaker prevents a non-qualified person from substituting a higher ampere breaker for a lower ampere



breaker, when the enclosure was originally wired for the lower ampere breaker. By preventing this substitution it helps to eliminate various electrical hazards, fires, etc.

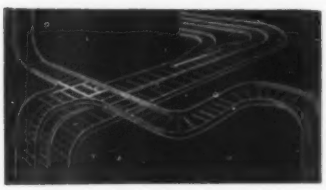
The breakers are divided into the following classifications: first classification—0 to 20 ampere, single and double pole; second classification—21 to 50 ampere, single and double pole.

The non-interchangeable enclosures are equipped with breaker support channels, which are punched and coded for easy custom blocking by the installing electrician, with the aid of only a screwdriver, by inserting a hardened, self-tapping, no-return screw, into the punched hole.

Write P-444 on reply card, page 19.

Heavy small-power, control cables supported by trays

CABLE TRAYS with four-inch deep sides and cross-rungs at the bottom and constructed from aluminum alloy or roll formed galvanized steel chan-



nels support heavy loads of small power and control cable installed over long spans. They have been announced by Husky Products, Inc., Cincinnati, Ohio.

Rungs are spaced on nine-inch cen-

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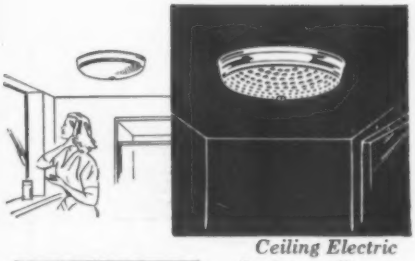
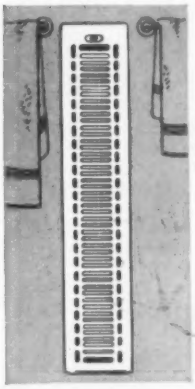
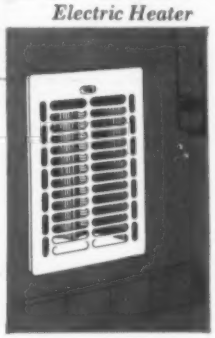


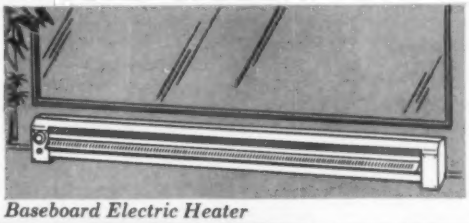
Ceiling Electric Bathroom Heater



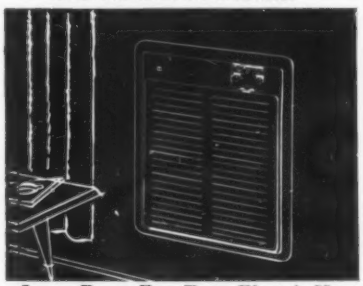
Full-Length Bathroom Electric Heater

Space Saver Bathroom Electric Heater

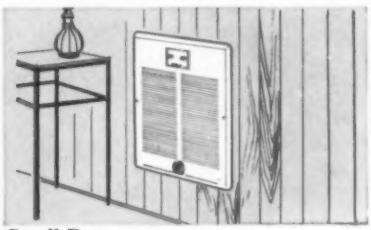




Baseboard Electric Heater



Large Room Fan-Type Electric Heater



Small Room Fan-Type Electric Heater

Originator of the Fan-Type Electric Heater

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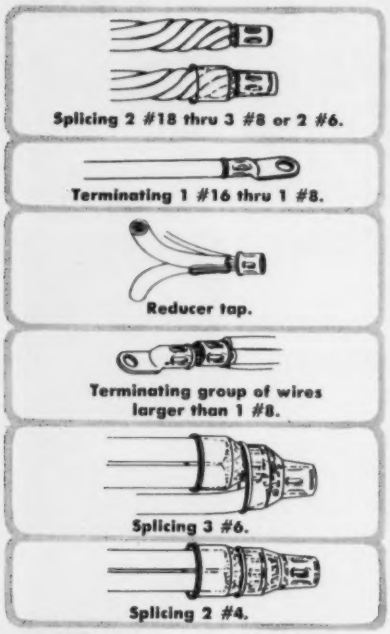
Buchanan Splice Caps and Termend lugs are self-positioning in the tool and provide high strength, vibration proof connections.


Splicing 2 #18 thru 3 #8 or 2 #6.
Terminating 1 #16 thru 1 #8.
Reducer tap.
Terminating group of wires larger than 1 #8.
Splicing 3 #6.
Splicing 2 #4.

pres-SURE TIPS BUCHANAN

Write for pres-SURE-TIPS —showing how Buchanan pres-SURE-connectors do the work of two, three or four conventional solder or solderless devices. Ask for Bulletin S-4

Approved for splicing 2 # 18 thru 3 #8 or 2 #6 and for terminating 1 #16 thru 1 #8. Insulators approved for 600 volts on building wire, 1000 volts in fixtures and signs,-in applications to 105°C. (221°F.).

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ters. This allows entry of drop-out of cable between rungs without metal cutting in the field.

There are six standard widths, from six to 24 inches, and straight lengths of 12 and 24 feet. Horizontal and vertical bends of 15, 30, 45, 60, and 90 degrees are standard items. Inside radii are either 12 or 24 inches.
Write P-445 on reply card, page 19.

Spooled cords and sets counter display announced

AN ATTRACTIVE, heavy-duty self-service rack with an assortment of spooled cords and cord sets is being offered on a special deal by the Carol Cable Co., Pawtucket, R. I. The new red and blue rack, with a handy measuring scale on the top, contains seven spools of different type cords,

fifteen assorted cord sets and three free extension cords. The rack's cost is the same as the value of the three free extension cords, giving the purchaser the rack free when the three cords are sold.

The Carol Cable rack, termed the "Electrical Assortment #1", is designed primarily as a sales-building counter display for spooled cords and cord sets, but also doubles effectively for a convenient storage and dispensing rack for popular size cords. The spools turn freely on full-width axles and the cord sets hang on handy side-hooks. All cords and cord sets are plainly marked as to type, size, and insulation.
Write P-446 on reply card, page 19.

Ballast controls dimming fluorescent lamps

A FLUORESCENT dimming ballast by Superior Electric Co., Bristol, Conn., permits flickerless control over wide range of illumination.

The Luxtrol ballast has a range of maximum to minimum illumination in a ratio of 500 to 1.

All lights come on at the same time, and it is unnecessary to bring them up to full intensity before setting light control. Each ballast can control at least 50 per cent more 40-watt rapid start fluorescent lamps than with old-style ballasts.
Write P-447 on reply card, page 19.

Cool-operating ballast prevents coil heat rise

PLACED on the market by Sola Electric Co., Chicago 50, Ill., a new, cool-operating ballast for two 40-watt,

rapid start fluorescent lamps has a coil-temperature rise of only 42-degrees Centigrade.

The ballast displays reduced capacitor, case, and coil temperatures when subjected to "in-fixture" test conditions. These improved operating characteristics are said to contribute to full ballast life without a price penalty.
Write P-448 on reply card, page 19.

Over 100 controls included in time switch line

OVER 100 CONTROLS in the line of Intermatic time controls rated up to 55 amps at 125 and 250 volts provide timing operations for many diverse applications in industry, homes, and farms. Many of the models, products of International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill., are Tungsten-rated and able to carry

incandescent lighting loads with an inrush surge of more than eight times their normal amperage rating.

The Century series is 35 amp T-rated and permits up to 11 on-off operations a day by adding extra trippers to the 24-hour dial. Uses include signs, defrosters, blowers, attic fans, and motors.

The Skipper series has an extra day dial. Screws are inserted into appropriate holes in this dial for those days on which operation is to be skipped. Independently adjustable trippers, heavy-duty models, poultry time switches, 12-minute cycle timers, and seven-day program time switches are among the many models.

Write P-449 on reply card, page 19.

Lockoff standard feature of manual starters

A NEW EXTERNAL lockoff arrangement is now a standard feature of Square D manual starters in general-purpose enclosures, from Square D Co., 6060 Rivard St., Detroit 11,

Mich. Designed to provide extra safety, the new lockoff makes it possible to lock the starter in the "off" position without removing the cover.

All Square D general-purpose manual starters are now furnished with both an internal lockoff on the operating mechanism, and an external lockoff which combines both the cover lockout and button lockoff features.

Write P-450 on reply card, page 19.

Powerful fluorescent lamp allows higher light levels

A FLUORESCENT LAMP, claimed to be the world's most powerful, has been developed by the Large Lamp Department of General Electric, Cleveland, Ohio.

An improved version of the Power-Groove lamp, the new tube produces 15 per cent more light while consuming only seven per cent more electric power. The price remains unchanged for this lamp model.

Light increase is achieved by redesign of the Power-Groove lamp. The new design involves grooves along opposite sides of the tube, rather than along only one side. This tube configuration, according to the makers, permits the use of thinner glass without making it less durable. Weight of the lamp is reduced by nearly one-fourth, making it easier to handle.

Write P-451 on reply card, page 19.

Aluminum entrance fitting snaps on, saves time

ONLY A SCREWDRIVER is needed to install a "snap-on" entrance head available from Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

The three sizes offered will fit 1¼-inch, 1½-inch, and 2-inch threaded or non-threaded, heavy, or thinwall conduit.

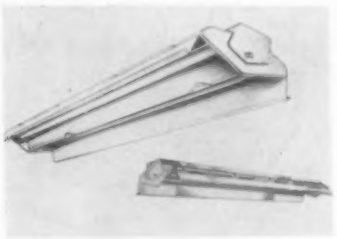
The new fitting has only three parts—hub, cover, and insulator—and is applied without threading. In use, the hub is slid down on conduit until it rests of self-centering pipe stop, set screw is tightened, cover is pried off, lead-in wires threaded through insulator, and cover is slid back along hub cover until self-locking grippers snap into position.

Except for plastic insulator, entire fitting is of aluminum alloy. Semi-punched insulator is automatically positioned by reassembly. Unit may be used either in horizontal or vertical position.

Write P-452 on reply card, page 19.

Color identifies purpose of industrial lights

INDUSTRIAL LUMINAIRES manufactured by Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo.,



are available with color coding.

Kolorkoded red units are used to identify exits and fire protection

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equipment; green luminaires identify general aisles, traffic lanes, and other safe through-passageways; yellow is used to identify stairs, curbings, dead-ends, or other dangerous areas. Kolorkoded units can also be utilized to designate or differentiate particular plant areas and to identify specific operations in the production line.

The Guth Wyteliners have drop-design end plate, and are for 430, 800, or 1500 milliamp operation. Reflector units are available in white porcelain enamel, baked-on white, or Alzak aluminum. Either 10 or 25 per cent uplight with 13- or 27-degree shielding using T-12 lamps can be supplied.

Write P-453 on reply card, page 19.

Service entrance fitting provides easy wiring

A CLEAN-LINED service entrance cable head for 100-amp service installation has been designed by the Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, Mo. The

aluminum fitting provides easy wiring with extensive "turn radius."

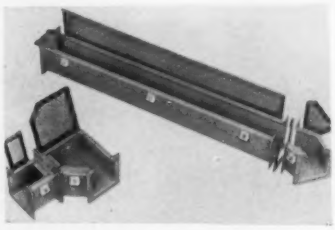
There are no loose parts; the lid fastens in place with one pressure screw. The split insulator reportedly assures easier wiring.

Write P-454 on reply card, page 19.

Wireway protects wires, speeds installation

WIREWAYS and fittings which protect wires against oil, dust, coolant, or water and allow wires to be laid in along an entire wireway run, have been developed by Hoffman Engineering Corp., Anoka, Minn.

The ends of each straight section

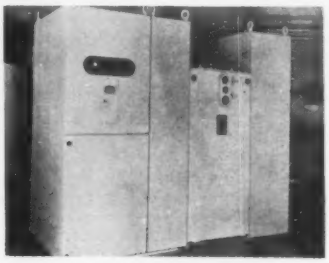


or fitting are flanged on three sides; a neoprene gasket is placed between the end flanges when pieces are bolted together. Standard wireway sizes are 2½" x 2½", 4" x 4", 6" x 6", and 6" x 12". Straight sections measure from 6" x 10'. The wireway is made of 14-gauge steel with 11-gauge end flanges. Finish is gray prime coat over phosphatized surfaces.

Write P-455 on reply card, page 19.

Expanded transformer line includes 112.5- and 150-kva

MODUPAC, a line of compact indoor substation transformers manufactured by Westinghouse Electric Corp.,



P. O. Box 2099, Pittsburgh 30, Pa., has been extended to cover 112.5- and 150-kva ratings.

The standard modular components of this line of self-contained liquid power centers are said to allow fast shipment and give greater flexibility since they are interchangeable between units. The transformer tank is braced for full vacuum.

Write P-456 on reply card, page 19.

Grounding practice

(Continued from page 70)

substation area covered by the grounding grid and note the number of ground rods.

(3) Estimate final ground resistance from curves of Fig. 2. The curves were developed from information in references shown at the end of this article.

Results of preliminary tests, and final measurements, at two recently constructed transmission substations are shown in Fig. 3. The results indicate fair agreement between predicted and final measured ground resistance. Similar results will be tabulated for future installations and it is hoped that this method of predicting ground resistance, when tempered with experience of final results, will serve as a useful measuring stick or guide in design of grounding systems on the Union Electric System.

References

(1) "Design Charts for Determining Optimum Ground Rod Dimensions."—Zaborsky and Ritenhouse—

AIEE Power Apparatus & System, August 1953.
(2) "Analytical Expressions for the Resistance of Grounding System."—Schwarz. AIEE Power Apparatus & Systems, August 1954.
(3) "Ground Resistance Testing"—Biddle Bulletin No. 1285.

Regulator study

(Continued from page 80)

method of paralleling. If regulator 1 is at one step raise, and regulator 2 is on neutral, there is a voltage differential of 5/8 per cent. However, the total loop impedance is practically zero, and even though the units are only one step apart, a circulating current of practically infinite magnitude could flow. This dangerously high current would damage either one or both of the regulators involved.

The circulating current is practically a pure reactive or quadrature current. Consider a paralleled system as shown in Figure 5, and assume equal impedances in both circuits of the loop. Also assume that regulator 1 is on a higher tap position that regulator 2 which means that the circulating current will flow from 1 to 2.

Disregarding load current, the output voltages of the two regulators, E_1 and E_2 are shown in Figure 6. The vector difference between the two voltages has been greatly exaggerated for clarity. Since the ratio of reactance to resistance is usually high, it can be assumed with reasonable accuracy that the resistance is zero and that the circulating current is a quadrature current.

Circulating current from unit 1 (I_{c_1}) flows through its total reactance and produces a voltage drop E_{1x} which lags I_{c_1} by 90 degrees. The current to unit 2 (I_{c_2}) flowing through its total reactance produces a voltage drop E_{2x} which lags I_{c_2} by 90 degrees.

E_1 plus E_{1x} is equal to E_1' which is equal to E_2 plus E_{2x} or E_2'. Assuming all of the impedance is in the transformers and regulators and there is no line impedance, then $E_1' = E_2'$ at the terminals of the regulator. This condition is true only because of the voltage drops produced by the circulating currents.

Vector diagrams in Figure 7 illustrate the effect of this circulating current on the two regulators. In the case of regulator 1, one half of the load current is being carried by this unit plus the circulating current, which results in a

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total current flowing in unit 1 as indicated by the dashed vector.

In unit 2 there is half of the load current minus the circulating current, which results in a total current as indicated by the dashed vector. It is evident that the effect of the circulating current will be dependent upon the power factor. However, in practically any case it will represent additional loading on one unit and probably a reduced loading on the second unit.

If both regulators and transformers are operating at rated capacity, then the circulating current could represent a considerable overload on one of the units.

As shown above, it is impossible to parallel only two regulators with no other impedance in the loop circuit. Should the occasion arise where there are no transformers in the loop circuit, then in order to parallel the two regulators, it would be necessary to insert the necessary impedance. This additional impedance usually takes the form of either air-core or oil-filled reactors.

These reactors are usually in series with each regulator as indicated in Figure 8. Assuming that a total of 4 per cent impedance is to be added in the loop circuit (limiting circulating current to 15 per cent provided the units are no more than one step apart), 2 per cent of impedance would be a series reactor with regulator 1. The other 2 per cent reactor would be put in the line with regulator 2. This not only limits the circulating current but it would also cause an equal division of the load between the two regulators.

Once the magnitude of the circulating current has been determined, the next step is to select the satisfactory paralleling scheme. Common types are cross-connected current transformer, negative reactance, current balance, and some type of electrical or mechanical interlock. Of the four, the current balance method is the most commonly used.

Electric home

(Continued from page 27)

has no plans at this time for introducing such a panel as a commercial product."

The actual light screen of the demonstration panel provides a range of hues from blue to blue-green to green. Other color combinations including the entire spectrum are possible, according to engineers at the Westinghouse lamp division in Bloomfield, N. J.

Part of the thermoelectric assembly is superimposed in artistic designs or "mobiles" of anodized aluminum in front of the electroluminescent screen of the panel. These mobiles serve to heat or cool the air of a room. The remainder of the thermoelectric assembly is hidden from view behind the glowing screen.

Controls for the entire panel consists of four dials: one to change color combinations; a second to vary the light intensity; a third to select either heating or cooling; and finally a thermostat for automatic temperature control.

In dimensions, the panel is 6 feet long and 4 feet high. It glows with a diffused light which is complimentary to the appearance of a room.

The thermoelectric effect is accomplished without the aid of any moving parts such as are present in the conventional refrigeration. Thermoelectric refrigeration produces cooling in special solid materials directly from the flow of an electric current. Heating occurs when the direction of current is reversed.

Electroluminescent lighting is produced by exciting a phosphor coating with an alternating current. This phosphor coating is sandwiched in a panel no thicker than a pane of window glass.

The principle of electroluminescence is used in Rayescent lamps now being produced by Westinghouse and available for applications other than general lighting. In addition, Westinghouse has just begun to market the first electroluminescent light for use by the public—a Rayescent Safety Light or night light that will consume less than a penny of electricity even though operated 24 hours a day for an entire year.

The "Food Preparation Center," said Mr. Witting, is designed for "the person who loves to create meals." There are platform ranges, an electronic oven to cook food in minutes, a 24-inch wall oven which can keep a roast rare and hot up to six hours, an infrared food warmer, waste disposers, plenty of refrigerator and freezer space. There is a planned place for everything, in-

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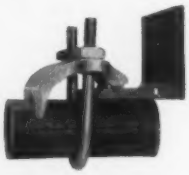
"Latrobe" Pipe or Conduit Clamp

This clamp is made with a double safety bite of case hardened tool steel. Two models—Right Angle and the Parallel support. Each model comes in 10 sizes to handle pipe or conduit ½" thru 4".



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cluding "every conceivable portable appliance with automatic timers."

A film which the Westinghouse executive used to help describe the concept of the Total Electric Home showed how such a house would look. The walk to the front door, for example, was clearly outlined by Rayescent strip lighting, "man's newest source of light."

Stepping onto the patio-like entrance, a visitor notices that outdoor lights automatically go on. A closed circuit TV camera could go into operation as the outside lights come up so that people inside are able to see who is calling. The door lock is controlled electrically from the inside.

Mr. Witting said that Westinghouse is organizing a national sales force of experienced men to work with builders and cooperating electric utilities on the Total Electric Home project. He said these men will coordinate the distributors of all Westinghouse products for the home and thus make it easy for builders to get what they require from one source at one time.

Mr. Witting said that the project had been named with forethought and care and that the idea of the "all-electric-home" has been "so diluted that we made a conscious effort to come up with a name."

"We called this project the 'Total Electric Home,' "he said, "because all electric homes have been conversational pieces for a long time. Many people with a few more appliances than their neighbors think they have one. Over the years the idea of the 'all electric home' has been so diluted that we made a conscious effort to come up with a name that would convey what we had in mind—a simple idea that everything in the house was electric—that there is no other source of energy or fuel."

Economic comment

(Continued from page 4)

doomed to failure.

The American public has shown, through its purchase of small imported cars, that they are anxious to make use of small and compact designs for economy's sake. However, the American producers must exercise ingenuity and creativity to gain this market and must not consider their new products as inferior in any way, shape, or form.

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GREENLEE

Wiring slogan

(Continued from page 24)

the hands of people who should have the story.

4. Promote use of the booklet and supplementary materials (such as NWB's "Electrifying Profits" folders) by means of discussions with local associations, distributors, and contractors.

For distributors

1. Obtain copies for your sales people and make sure they become acquainted with its contents and proper use.

2. Display booklet on city counters . . . at local trade shows and exhibits . . . use it as a key piece in offering helpful service to contractors interested in cultivating commercial wiring business.

3. Coordinate activity with contractors and utilities in the area.

For electrical associations

1. Make sure your members obtain copies and are acquainted with contents and proper use of the booklet. Tell them about the national program and how they can tie-in locally. (See NWB's plan book, "Let's Talk Business," especially pages 20 and 21.)

2. Stimulate use of the booklet and supplementary promotional items (such as NWB's "Are You Getting the Most Out of Your Electricity?") among industry allies.

3. Distribute copies to selected prospects by direct mail . . . at meetings and trade shows.

4. Consider local advertising—space, direct mail, or radio.

5. Make booklet subject of local publicity . . . reports in news bulletin if one is published by the association.

For electrical contractors

1. Obtain copies for distribution to key customers and prospects at local trade shows, meetings, and through personal calls and direct mail. (Supplementary items, such as NWB's mailing pieces, can also be distributed in this way.)

2. Work with the local electrical association, distributors, and your utility in seeing that every logical prospect receives a copy.

3. Send a copy to prospective customers along with each bid to help sell better and more complete wiring jobs.

4. Consider advertising the availability of booklet for interested prospects, along with your services to improve commercial wiring installations, in local newspapers and magazines, radio programs, and direct mail.

5. Suggest promotion of the booklet (and commercial wiring) as a joint venture. Recommend that your local contractor association consider an advertising program . . . space, direct mail, radio or television, to stimulate over-all interest in the subject.

Housepower plans

(Continued from page 25)

and a 39-piece slide film, both suitable for showing at group meetings, are available, as are five films, which vary in length from 20 to 90 seconds. These films feature a well-known television personality, and are suitable for showing as television commercials or at sales meetings.

The final entry in the Housepower price list is a 50-second animated fuse box television commercial. This commercial has been used previously on a network program, but contains no product or brand identification.

Wiring conference

(Continued from page 29)

course as a part of their curriculum.

Maintaining that "It's Good Business" for the electrical distributor to promote adequate wiring and Housepower, Thomas F. Preston, public relations manager for the National Association of Electrical Distributors, said that the distributor is the strongest coordinating link in the entire wiring and Housepower program.

There are in NAED, he said, close to a thousand distributors who are active Housepower and adequate wiring salesmen, even though they don't call themselves that. These men are proving the need for adequate wiring by selling the benefits of, and building the desire for, appliances—an indirect, but nonetheless effective way, maintained Mr. Preston, of selling wiring. Beyond this, the NAED member, he said, has rededicated himself to do a better job in the year to come, to get behind the wiring program locally.

Wiring standards improve

H. H. Watson, commercial engineer of the General Electric Company, Bridgeport, Conn., told con-

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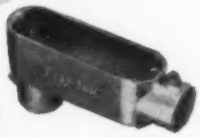

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ferees that sound engineering principles had become the basis for standard wiring practice and the new electrical standards of the FHA and the National Electrical Code.

Mr. Watson, a member of the Industry Committee on Interior Wiring Design and a member of the National Electrical Code Correlating Committee, discussed the new Federal Housing Administration's Minimum Property Standards and the new National Electrical Code and how the improved standards, which will closely parallel those of the National Wiring Bureau, would affect wiring promotion.

The electrical section of the FHA Minimum Property Standards represents a minimum of interior wiring for residences to assure that within the 20 or 30 years for which a mortgage loan is insured, the security for that loan will remain a marketable property.

Mr. Watson noted that under the new standards, FHA had gone to 100-ampere service, increased lighting and receptacle requirements and a substantial increase in branch circuit capacity. He also noted that the new National Electrical Code (which is sponsored by the National Fire Protection Association) will also require 100-ampere service, and will have increased circuit requirements.

Thinking, however, in terms of future loads such as for heating and cooling, Mr. Watson suggested that wiring for such substantial loads needs the industry's attention. While the standards have been improved, he said, there are "still 25 million or more houses in the U. S. that are significantly substandard in wiring," revealing a need for wiring promotion.

Home building, he emphasized, is a "substantial partner in the American economy" and the new home builder, as well, will continue to need promotional help from the electrical industry.

Mr. Watson indicated that a "far away and idealistic" target should be set for wiring in new homes, as a means of attaining a realistic goal ten years from now.

Customers speak their minds

A homemaker, a building manager and a general contractor freely spoke their opinions about residential and commercial wiring problems in front of members of the electrical industry. The panel discussion was moderated by A.

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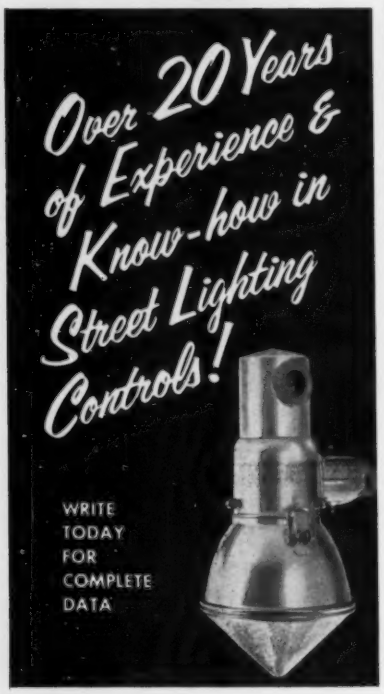

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B. Lindauer, dealer sales manager of New Orleans Public Service, Inc.

The homemaker, Mrs. Charles H. Hiern, of New Orleans, revealed her own experiences with electrical contractors in rewiring an old home, and suggested some ways she believed the service could be improved from the home owner's side of the picture.

T. Hewson Lynch, Jr., manager of the Pere Marquette Building, New Orleans, gave his viewpoint on commercial adequate wiring problems as they relate generally to building owners and building managers. Said Mr. Lynch: Even though building owners are periodically forced into upgrading wiring because of tenant demands, the primary aspects of available funds and immediate needs still govern the extent to which adequate wiring for the future can be installed.

Martin M. Gurtler II, president of Gurtler, Herbert & Co., New Orleans, a builder, told conferees about some typical problems the general contractor facts with respect to wiring and lighting. Regarding the promotion of wiring, Mr. Gurtler suggested that perhaps more emphasis should be placed in the area of the consulting engineer and the architect rather than on the consumer. The electrical contractor, he said, is ordinarily not involved early enough in the designing and planning of homes, for his knowledge to be reflected in the plans and specifications.

Look Magazine awarded its "Oscars" for residential wiring promotion for the fifth consecutive year. Robert C. Marshall, Ltd., won the award for electrical contractors. Baltimore Gas & Electric Company won the award in the category of utilities with over 250,000 meters, and Kentucky Utilities Corporation in the category of under 250,000 meters. Farrell-Argast Electrical Company, Indianapolis, received the award for distributors.

Other major features of the conference included an extemporaneous panel discussion among electrical contractors from widely separated areas of the United States, and a presentation of a new commercial wiring program in St. Louis. Milton Allen, vice-president of Philadelphia Electric Co., was conference chairman and C. L. Osterberger, vice-president of Louisiana Power and Light Co., presented the keynote address.

Bid depository

(Continued from page 44)

pository; said bids will be available for inspection by any participant or user of the depository or any other person or persons approved by the Board of Directors. All such bids shall be maintained in the files of the depository for a period of one year after date of opening.

NECA meeting

(Continued from page 40)

a single job; from $5,000 to $25,000 as the second step or classification; from $25,000 to $50,000 in the third step; and from $50,000 up to classified "unlimited". He asserted that such classifications would be a good safeguard to the public, and would actually affect fewer than 150 of the approximately 1,700 contractors operating in North Carolina.

He also recommended this formmula for firms engaged in contracting for furnishing and installing various small electronic systems, such as certain types of communications networks, wired music, hospital nurses call and paging systems, closed circuit television systems, etc.

Mr. Shockley, as chairman of the State Licensing Board in South Carolina, told of the vastly improved communications, cooperation, and "confidence" now being manifest among the several South Carolina groups directly connected with the construction business—general, electrical, plumbing and heating contractors, etc.—at least partially due to the over-all features of the state's new licensing procedures.

The board chairman gave some background as to how this cooperative, mutually advantageous attitude had come about.

Concluding, he said, "Today, the construction industry is more closely knit than at any other time. There is hardly a building constructed in which practically all trades are not represented. This means the problems that arise are becoming more and more common to everyone on the job. Further, if any one trade stands aside and lets another suffer reverses and abuses by the outside—eventually each trade will suffer, because it is like a creeping paralysis, or it conquers by overthrowing one branch at a time. It would surprise everyone what could be accomplished for the good of the industry, and the pub-

lic whom we serve, if we would recognize ourselves as members of a team and cooperate to reach our objectives. To reach this goal, there is only one way—and that is to meet the problem 'together with confidence, integrity and trust'."

Mr. Clemmer, AIA Chapter head, discussed problems which are common to architects and electrical contractors, and urged even greater understanding and cooperation between the two groups.

Mr. Evans described in detail the survey planned by his agency for the Chapter, in which every member-firm would be contacted personally by agency representatives, in the next 120 days, in an attempt to determine the organization of the various firms, their market potentials, etc., and thereby dedicate what the agency could do on an advertising and promotional program for the chapter as a whole—if such a program appeared feasible.

"We must know as much about your business as any salesman you have, before we can intelligently recommend an advertising program for the chapter," declared the agency official, who was introduced by Howard Pancoast, of High Point, N. C., a chapter director.

North Carolina State College Engineering Foundation has just experienced the greatest year in their history, according to Mr. Hart, reporting that the $250,000 income for the foundations in 1958 compared with the previous high of $90,000 in 1957, and the slightly more than one million dollars realized since the Foundation was established in 1944 by the late Governor Broughton and a group of interested Tar Heel businessmen. He expressed appreciation for the outstanding cooperation of the chapter as a whole, and the efforts of certain individual members.

A report on activities of the South Carolina Electrical Contractors Association was given by L. G. Funderburk, along with a detailed recounting of the very successful operation of the Columbia Bid Depository, begun more than a year ago.

He was followed by H. L. Elsey of Charleston, S. C., who told of the equally successful, but somewhat differently organized, Charleston Bidding Service.

A most enjoyable program feature was the humorous presentation of Mr. Jones, whose "How to Make Money" talk kept his audience in stitches.

Chapter officers, in addition to Mr. Colter, include: vice-president, Marshall H. Walker, Rock Hill, S. C.; treasurer, Jack Bryant; secretary, W. W. Hanks; district governor, Ralph K. Robinson; and chapter manager, Dwight L. Casey, all of Charlotte, N. C.

Code discussion

(Continued from page 94)

for each conductor except those looping through. We will continue with General Requirements for Wiring Methods in the next issue of this magazine.

Following are answers to Code test questions: (1. **F** section 3003-a) (2. **T** section 3003-a) (3. **F** section 3002) (4. **F** section 3003-a) (5. **T** section 3003-a) (6. **a** section 3004) (7. **b** sections 3004 and 3710-c) (8. **b** section 3006) (9. **c** sections 3005 and 3625) (10. **c** sections 3005 and 3748-a).

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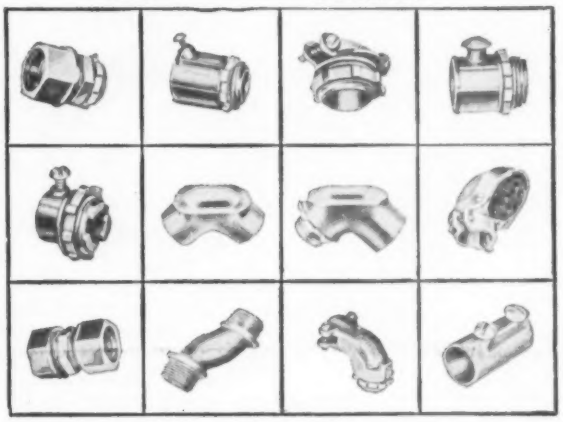

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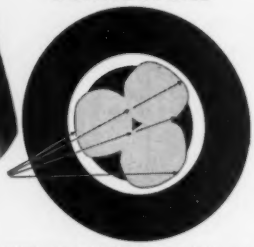

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A
Accurate Mfg. Co. 124
Adam Elec. Co., Frank 5
Advance Transformer Co. ..... Second Cover
Allen-Bradley Co. 97
Allis-Chalmers Mfg. Co. 77, 79, 81
All-Steel Equipment, Inc. 91
American Pamcor Inc. 59
Appleton Elec. Co. 103
Arrow-Hart & Hegeman Electric Co. 118
Atlantic Conduit Fittings Co. 126
Atlas Elec. Prods. Co. 120

B
B & C Metal Stamping Co. 58
Bell Electric Company 113
Blackburn Corp., Jasper 87
Blackhawk Industries 131
Briegel Method Tool Co. 99
Buchanan Elec. Products Corp. 128
Bulldog Elec. Products Co. 33, 35
Bussman Mfg. Co. ..... Back Cover

C
Carol Cable Co., Div. of The Crescent Co., Inc. 111
Cavalier Corporation 121
Ceilheat Inc. 131
Champion Lamp Works 109
Chance Co., A. B. 61
Circle Wire & Cable Co. 105
Clayton Mark & Co. 43
Copperweld Steel Co. 50, 51
Cornish Wire Company 122
Cross Company, W. W. 116

D
Diamond Wire & Cable Co. 41
Duncan Electric Mfg. Co., Inc. 45, 46

E
E J S Lighting Corp. 63
Electrical Insulation Suppliers, Inc. 133
Electri-Flex Company 126
Elliott Elec. Products Co. 135
Estimating Handbooks Associates 124

F
Fanner Mfg. Co., The 114
Farnham Equipment Company Inc. 137
Fast-Lok Manufacturing Company 135
Federal Pacific Elec. Co. 15
Fullman Mfg. Co. 132
Furnas Elec Co. 135

G
General Elec. Co., Apparatus Dept. 64, 65
Gibson Manufacturing Co. 38, 39
Greenlee Tool Co. 134
Guth Company, Edwin F. 107

H
Helwig Company 126
Henderson-Hazel Corp. 130
Hotpoint Company 115
Hubbard & Co. 54
Hunter Div., Robbins & Meyers, Inc. 10

I
Ideal Industries, Inc. 138
Ilsco Corporation 9

K
Kearney Corp., James R. 52, 53

L
Light & Power Utilities Corp. 17, 18
Lighting Dynamics, Inc. 1

M
Mason Co., L. E. 95
Mears Electric Controls Inc. 93
Miller Co. 7
Moloney Elec. Co. 56, 57
Morrison-Pelsue Company 129

O
Orangeburg Mfg. Co., Inc. 62

P
Paranite Wire & Cable Company 2
Pass and Seymour, Inc. 133
Peerless Elec. Co. Fan & Blower Div. 123
Phelps Dodge Copper Products Corp. 83
Pittsburgh Standard Conduit Co. 142

R
Ripley Co., Inc., The 136
Rodale Mfg. Co., Inc. 12
Roebling's Sons, Inc., John A. Elec Wire & Cable Div. 60

S
Sangamo Elec. Co. 48, 49
Sherman Mfg. Co., H. B. 125
Smithcraft Lighting Division 101
Southwire Company 37
Square D Co. ..... Third Cover
Stephens, Inc., M. 137
Sunbeam Lighting Company 11
Superior Cable Corp. 117

T
Theil Tool & Eng. Co., Inc. 136
Thermador Elec. Mfg. Co., Div. Norris Thermador Corp. 127
Thomas & Betts Co. 66
Triangle Conduit & Cable Co. 6

V
Virden Company, John C. 55

W
Wadsworth Electric Mfg. Co. 120
Wagner Elec. Corp. 85
Weaver Co., J. A. 13
Westinghouse Electric Corp. 67

Y
Youngstown Sheet & Tube Co. 21

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Following is a list of MANUFACTURERS' AGENTS who represent Advertisers appearing in *this* issue of ELECTRICAL SOUTH. Consult the Advertisers' Index on the preceding page for quick location of ads.

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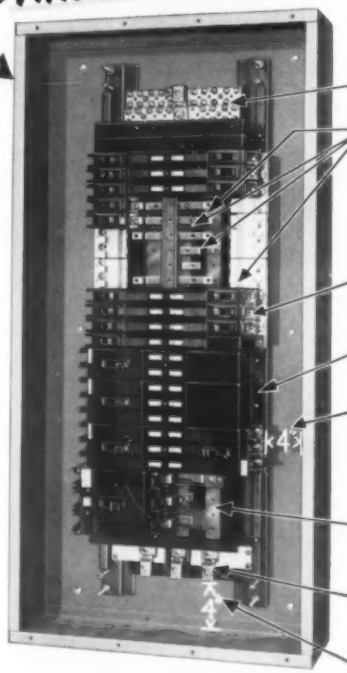

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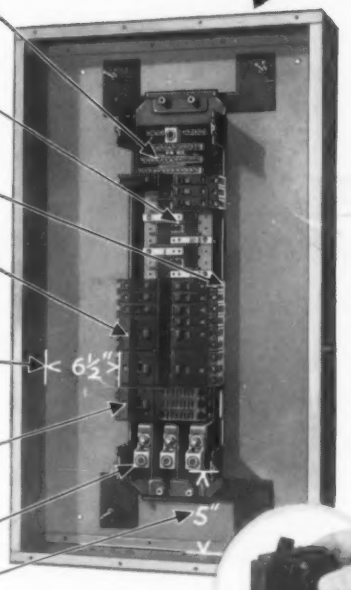

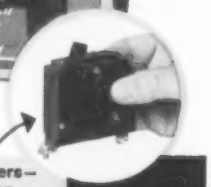

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They stop overloading of circuits —

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